

18659 **Railway  
Mechanical Engineer**

April  
1945

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COPY

GIFT

*Save wheels!*

**..REDUCE FLANGE WEAR**



*Specify*

**WINE**

THE WINE  
RAILWAY APPLIANCE CO.  
TOLEDO, OHIO

**BRAKE  
BALANCER**

# UNIT TRUCK

## RUGGED CONSTRUCTION



**T**HE Vertical Brake Beam Flange extends through the Brake Head, producing a rugged assembly. The hardened Wear Plate protects the Brake Beam for many years of service.

**UNIT TRUCK CORPORATION**

140 CEDAR STREET

NEW YORK, 6, N. Y.



**ODORS Quickly Destroyed with**

# OAKITE TRI-SAN

*It's New!  
Different  
Economical  
Safe!*

**CLEANS • DEODORIZES • DISINFECTS... IN ONE OPERATION**

Oakite TRI-SAN provides a **LOW-COST** answer to every railroad's problem of quickly destroying odors in passenger coaches, smoking cars, troop and hospital trains . . . and **CLEANING** and **DISINFECTING** surfaces at the same time in **ONE** single operation.

Did we say **LOW-COST**? Yes . . . an ounce of Oakite TRI-SAN to a gallon of water makes a solution costing only one cent! Merely apply solution to surfaces with mop, brush or cloth. Oakite TRI-SAN has **NO** odor . . . leaves **NONE**. Comes in powder form, contains no poisonous or corrosive ingredients, is **SAFE** to use and handle. Write today . . . arrange for a demonstration on your road.

## **YOU CAN SAVE TIME & MONEY**

**by using Oakite TRI-SAN for**

**Cleaning, Deodorizing and Disinfecting:**

**HOSPITAL TRAINS • TROOP TRAINS • LAVATORIES**

**PRISONER TRAINS • FREIGHT CARS • WASHROOMS**

**COACHES • SMOKERS • REFRIGERATOR CARS**

**Send for FREE 16-page booklet giving formulae and methods for using Oakite TRI-SAN.**

**OAKITE PRODUCTS, INC., WRIGLEY BUILDING, CHICAGO 12, ILL.**

**In Canada: OAKITE PRODUCTS OF CANADA, LTD.**

**TORONTO: 65 Front St. East—MONTREAL: 1 Van Horne Ave.**

**OAKITE  
RAILWAY SERVICE DIVISION**

Disinfects and deodorizes lavatories in compartments.

Stale smoke odors minimized in smokers.

Oakite TRI-SAN destroys odors in troop trains.

# THIS Air throttle

feature



adds safety  
and simplicity on

## Baldwin-Westinghouse

Air has an important new job in these modern Diesel-Electric locomotives. It's been stopping trains for over 75 years—now it helps to run them, too.

With the engine idling, movement of the control handle first establishes the electrical connections, then actuates the governor operation. Location of the graduating control handle determines the degree of governor action.

The only connection between control valve and engine is a single pipe. The complications

of installing and maintaining mechanical linkage are eliminated, and in case of damage to the line, engine speed immediately drops to idling—a positive safety feature. When two locomotives are operated in tandem, control can be centered in one cab, merely by adding a few simple pieces of additional control equipment.

The accumulated experience of two great companies is embodied in Baldwin-Westinghouse Diesel-Electric Locomotives.

**IN THE LEAD WITH  
NEW DEVELOPMENTS**

Air Throttle Control  
Automatic Wheel-Slip Control  
Automatic Temperature Control  
1-3, 2-4 Motor Load Transfer Hook-up  
Life-extension for Liners  
Advanced Electrical Features



**Diesel-Electrics**

THE

**BALDWIN**

LOCOMOTIVE WORKS, PHILADELPHIA

**Westinghouse**

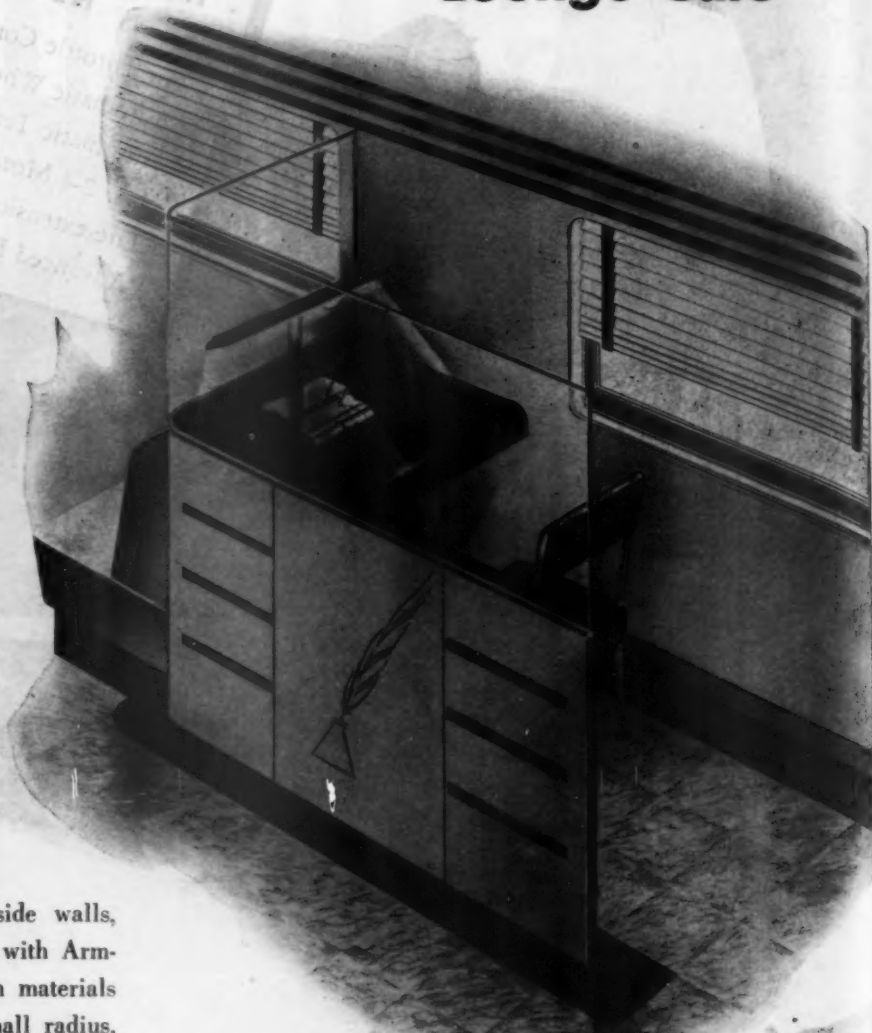
ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.



# ADVANCED STYLE NOTES FOR POST-WAR PASSENGER CARS

## Lounge Cars

**A Practical New Idea** for writing alcove. High side wall provides privacy . . . helps shield against disturbing conversational noises. Lower half of wall is surfaced with Armstrong's Linoleum. Design can be rendered by sandblasting, hand carving, inlaying, or a combination of all three. Upper half is clear plastic. Desk top is surfaced with linoleum, too. Ink stains wipe off with a damp cloth.



**Colorful, Modern Surfaces** on side walls, bulkheads, and ceilings are created with Armstrong's Linoleum or Linowall. Both materials can be formed around curves of small radius. They have a durable, lustrous finish that's easy to keep free of dust and dirt . . . take bumps from luggage without chipping.

**Custom-styled, Durable Floors** in almost unlimited designs are obtained with Armstrong's Linotile (Oil-bonded). Linotile keeps its beauty for years.

**Armstrong's Cork Base** underlayment saves weight and resists indentation. It can be used over Keystone, Chanarch, or any other type of floor plate.

**ARMSTRONG'S** versatile floor and surfacing materials offer you unusual durability—limitless possibilities for smart, modern effects in design and color in every type of passenger car. For complete information and free samples of Armstrong's Linoleum, Linowall, and Linotile, write Armstrong Cork Company, Industrial Division, 7404 Arch Street, Lancaster, Pennsylvania.



**ARMSTRONG'S**  
FLOORS and SURFACING MATERIALS  
for passenger cars

**"Show him in"**



An "M-F" representative is at home in the front office or in the shop.

He is a specialist in the fastening of cars and locomotive parts.

He is looking ahead while solving today's problem.

He is glad to pass on suggestions that others have used in solving bolting problems.

This specialization has been going on for over 25 years . . . representing a large fund

of experience to draw upon.

They are small items . . . these "M-F" Lock Nuts . . . Water-Tight Bolts . . . Lock-Tight Floor Clips . . . Collar Bolts . . . but their proper application insures long lived cars.

An "M-F" representative is always ready to serve you.

"M-F" Water-Tight Bolt  
and Lock Nut



The "M-F" plant is equipped with modern machinery, arranged to produce rapidly and economically. On time delivery has always been an M-F slogan.

## **MACLEAN-FOGG LOCK NUT COMPANY**

2649 N. Kildare Avenue, Chicago 39, Illinois • In Canada: The Holden Co., Ltd., Montreal



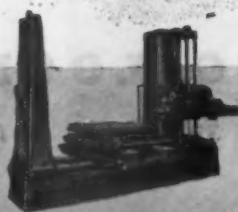
Bird's-eye view of 5 standard G. & L. beadstocks arranged on standard units, boring marine turbine reduction gear cases.

*Boring Time  
Cut from 488 to  
39 Hours*

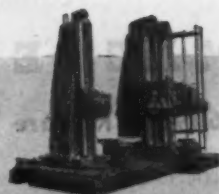
**GIDDINGS & LEWIS**  
150 DOTY STREET



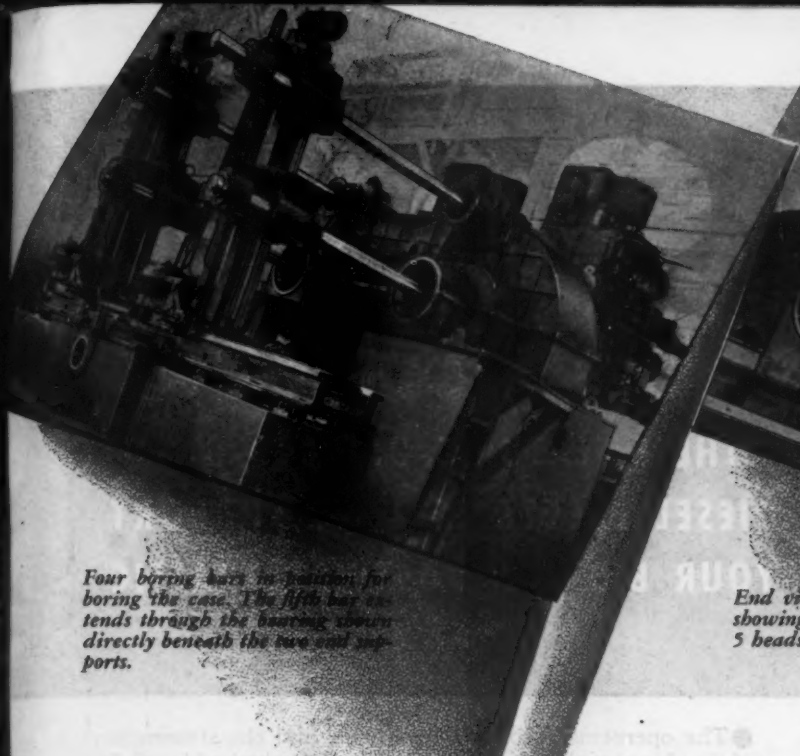
Right: G. & L. Table  
Type Machine.



Right: G. & L. Floor  
Type Machine.







Four boring bars in position for boring the case. The fifth bar extends through the housing about directly beneath the two end supports.



End view of assembled machine showing the arrangement of the 5 headstocks.

## Standard G. & L. Headstocks on Standard Machine Units Bore 5 Bearings Simultaneously in the Time Usually Required for 1

The combination of five Standard headstocks on Standard units cut floor-to-floor production time on this gear case 449 hours. This tremendous saving was made possible by boring the 5 housing bearings simultaneously. The main bearing in the gear case is 35" in diameter and 24" in length. While the main bearing is being bored, two intermediate bearings, 16" in diameter and 14" long, and two upper pinion shaft bearings, 12" in diameter and 10" long, are completed. All five bores are finished in the time it takes to bore the main bearing.

## Center Distances are Fixed and All Bores are in Accurate Alignment

The reduction in the machining time was made possible by fixing the headstocks and columns so all bearings are bored in one setup of the gear case, without the necessity of making any settings or adjustments. No time is lost in gaging the bores for correct spacing and parallel alignment. In addition to the

saving in floor-to-floor time, the high degree of accuracy of the finished case permitted further substantial savings in the assembly of the gears and made the various components interchangeable.

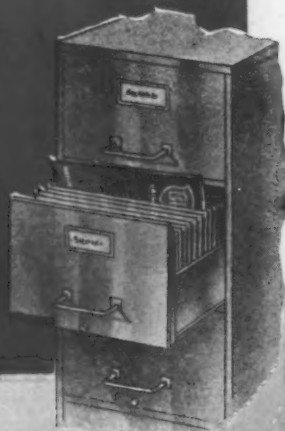
Should the dimensions of the gear case be changed at any time, all units can be relocated to suit the new conditions, and should the building of marine reduction gear cases be discontinued entirely, the machines can be separated into four complete Standard No. 360 Floor Type G. & L. Horizontal Boring, Drilling and Milling Machines with 6" spindles, and one No. 560 Headstock with boring bar supports for 10" diameter bars.

If your production demands machining work of this character, you too can profit by using G. & L. Horizontal Boring, Drilling and Milling Machines. Consult Giddings & Lewis engineers to help solve difficult machining jobs. There is no obligation for this service.

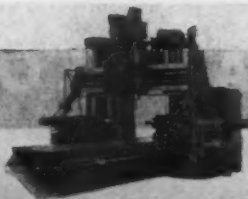
**MACHINE TOOL CO.**  
FOND DU LAC, WIS.

## Additional Data

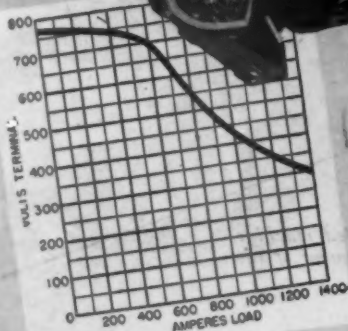
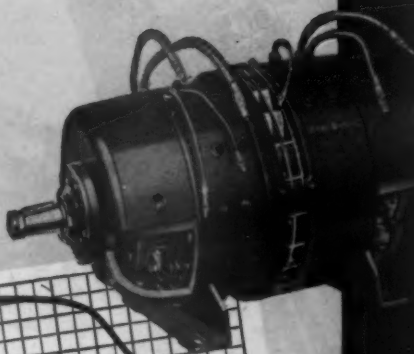
...covering the complete line of Giddings & Lewis machines and their working accessories is contained in this catalog. Write for your free copy today. Please indicate your mail address and company name. No obligation.



Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.



# 8 plus values

THESE FEATURES OF ALCO-G. E.  
DIESEL-ELECTRICS WILL SUPPORT  
YOUR BID FOR POSTWAR TRAFFIC

**+1** **CONSTANT POWER OUTPUT** is maintained throughout the normal speed range of the locomotive by this specially designed split-pole exciter. It's a simple magnetic circuit which requires no maintenance or adjustment.

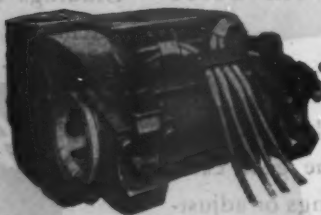


● The operating records of railroads, and the statements of the shippers they serve, prove how effectively Alco-G.E. diesel-electrics are helping their users prepare to meet profitably the stiff competition that will come after the war. These units are doing it by slashing locomotive operating expense as much as 35 per cent, and by earning the loyalty of shippers by their fast, clean, and safe switching.

These competitive advantages come from the distinctive features we have developed as a result of our 20 years' experience building diesel-electrics for all types of railroad service. These features, added to the high thermal efficiency of the diesel engine are the reason why six Alco-G.E. diesel-electrics on one road are saving, in fuel alone, each year, more than the cost of one unit; why three units, on another road, have turned in more than 40,000 locomotive-hours without an overhaul.

You can determine the extent of Alco-G.E. savings on your road by having our engineers work with your organization on a motive-power survey. Our recommendations will be impartial—we build all three types of motive power—diesel-electric, electric, and steam.

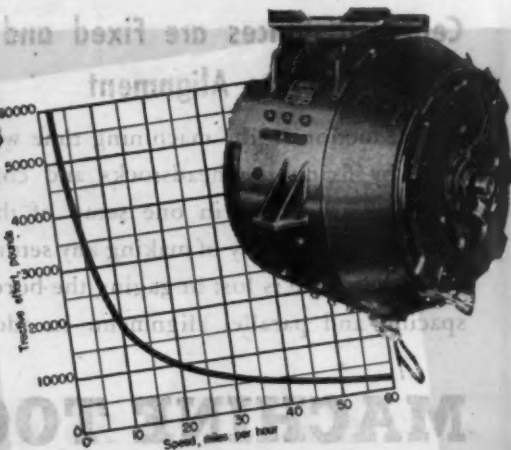
**+2** **LONG EARNING LIFE**, a result of the judicious use of recent metallurgical discoveries and modern methods of fabrication, such as all-welded structure, enables Alco-G.E. diesel-electrics to keep on saving money long after they have paid for themselves.

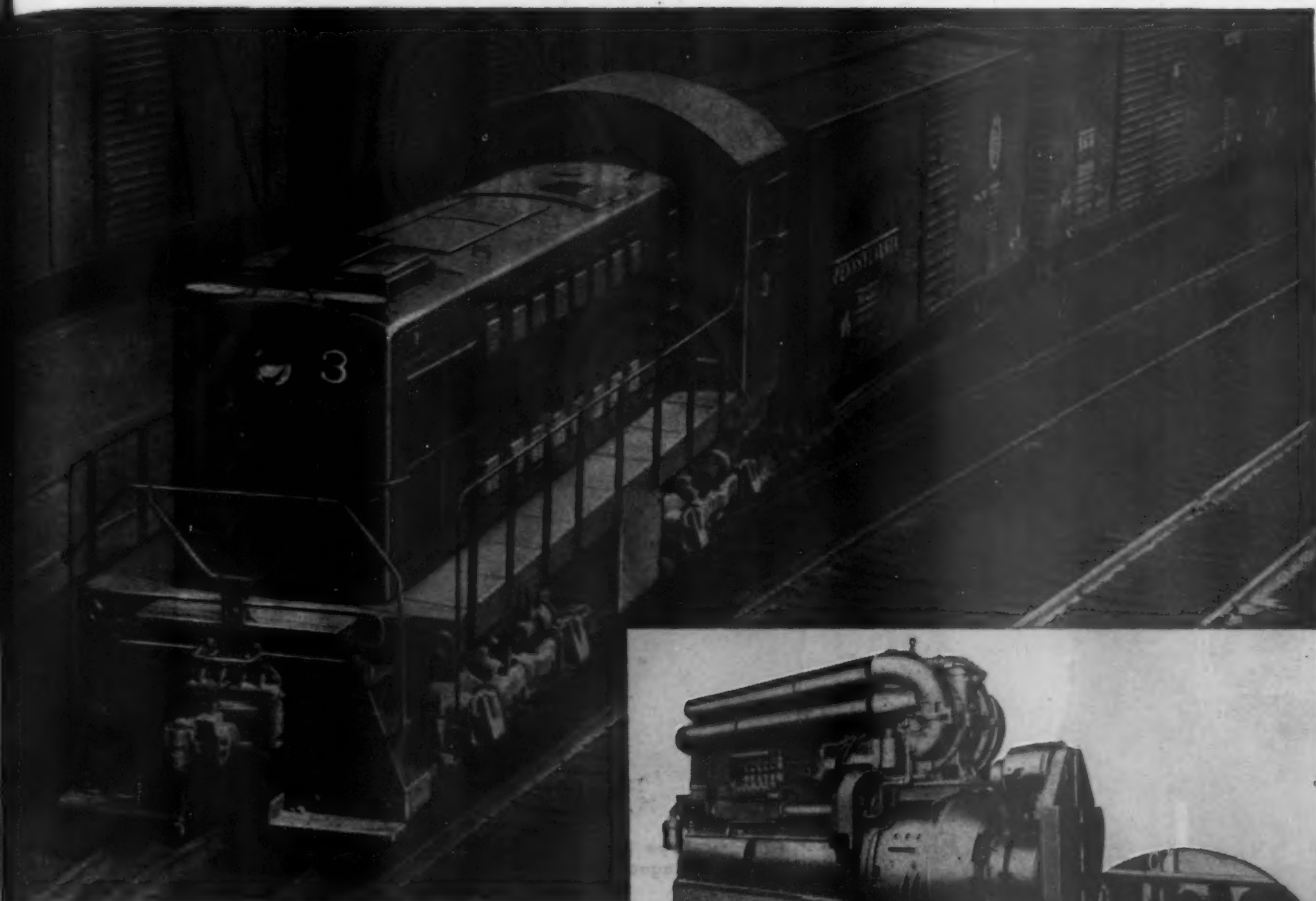


**+3** **FAST ACCELERATION** and high average and top speeds are produced by G-E electric drive, which is designed to match the characteristics of the diesel engine. The generator is direct-connected to the engine frame to assure permanent alignment, and the traction motors have exceptionally rigid armatures that reduce wear on gears and pinions.

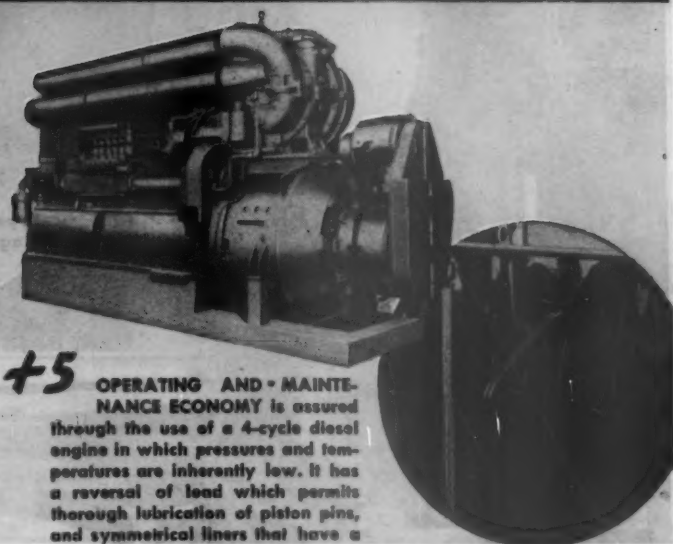


## AMERICAN LOCOMOTIVE





**+4** EXTRA AVAILABILITY is obtained with Alco-G.E. diesel-electrics because they are exactly suited to their jobs. On one eastern road, for example, eight of these units are averaging 98.7 per cent availability. As the pioneer builders of diesel-electric locomotives, we have gained unequaled experience and an intimate knowledge of railroad operating requirements and maintenance facilities.



**+5** OPERATING AND - MAINTENANCE ECONOMY is assured through the use of a 4-cycle diesel engine in which pressures and temperatures are inherently low. It has a reversal of load which permits thorough lubrication of piston pins, and symmetrical liners that have a smooth, unbroken surface.



**+6** 20% FUEL SAVINGS are obtained through the use of belt-driven auxiliaries, which permit Alco-G.E. engines to idle at 250 rpm, rather than the higher speeds required when auxiliaries are driven electrically or directly by the engine.

**+7** EASE OF INSPECTION and maintenance are assured by the complete accessibility of parts. Doors are provided at both sides of the hood, at the forward end, and between the cab and hood. Hatches over the diesel engine facilitate removal of the cylinder head, and the entire section of the hood over the engine-generator set is removable.

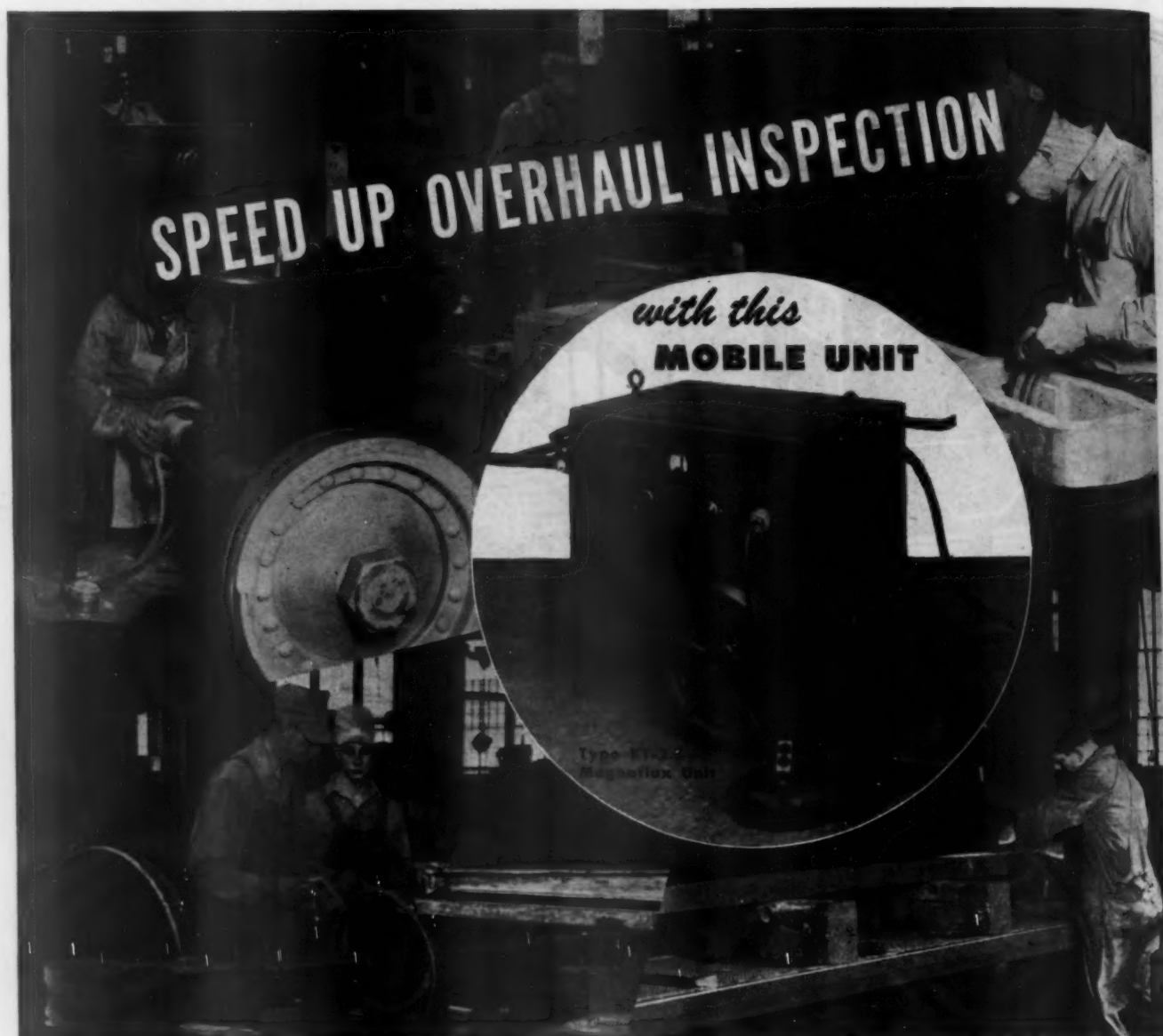
**+8** FULL VISIBILITY makes for fast, safe switching and reduces danger of damage to cars and lading. The low, narrow hood and wide cab windows give the operator a full view forward and backward.



113-126-0000

and GENERAL ELECTRIC





## New "Push-cart" MAGNAFLUX\* UNIT

**Assures Fast, Low-Cost Inspection for Every Job in Roundhouse and Carshop**

(Price Complete, \$455.00 F.O.B. Chicago)

Even the smallest roundhouse, carshop or backshop can use this Type KT-2.5 Magnaflux unit to profitable advantage. It makes magnetic particle inspection practical and economical for all car, locomotive and similar parts. Use it to locate fatigue cracks and head off breakdowns of equipment in service.

Magnaflux is good maintenance insurance . . . It spots unseen defects accurately, reveals specifically the causes of

probable failure . . . and does so at top production speed.

This unit, designed particularly for railroad use, is compact and rugged . . . Its all-steel welded frame stands plenty of shop punishment . . . Equipped with 16-inch rubber tired wheels—also with heavy eye bolts for convenient handling by an overhead crane.

Magnaflux equipment provides the thorough inspection that safety demands.

*\*Magnaflux, Registered U. S. Patent Office, a trade mark of the Magnaflux Corporation applied to its equipment and materials for magnetic particle inspection.*



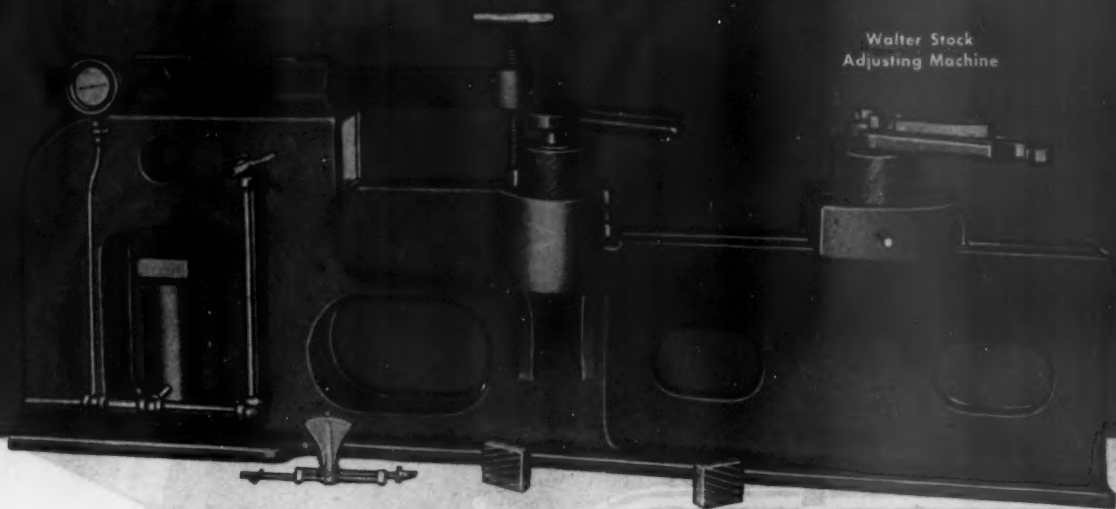
**MAGNAFLUX CORPORATION**

5920 Northwest Highway, Chicago 31, Illinois

NEW YORK • DETROIT • DALLAS • LOS ANGELES • CLEVELAND • BIRMINGHAM

# THIS ONE MACHINE

## Does 36 Hand Jobs



Walter Stock  
Adjusting Machine

With this Walter Stock Adjusting Machine you can do *mechanically* all the customary heavy and costly *hand* repairs required to keep various parts of the running and valve-motion gear of locomotives operating efficiently. You can do these jobs more quickly, reduce shop costs, and shorten the length of time locomotives are out of service.

Also, the most important forge shop job — adjusting pedestal binders — can be done on this machine so accurately that the binder requires no fitting or machining.

The Watson-Stillman Co., Roselle, New Jersey.



Bulletin No. 540-A is one of a new series of bulletins describing W-S railroad shop equipment. It gives full details on the construction of the Walter Stock Adjuster, specifications, and operation of the Adjusting Gauge. It also contains a description of upsetting, lengthening and straightening operations on draw bars, eccentric rods, guides, main rods, valve rods, and similar work. Write for YOUR copy of this Bulletin, No. 540-A, and others on W-S railroad shop equipment.

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THIS ONE MACHINE

# TRAIN

**ELECTRIC SERVICE MANUFACTURING**  
DESIGNERS, ILLUMINATION ENGINEERS and MANUFACTURERS

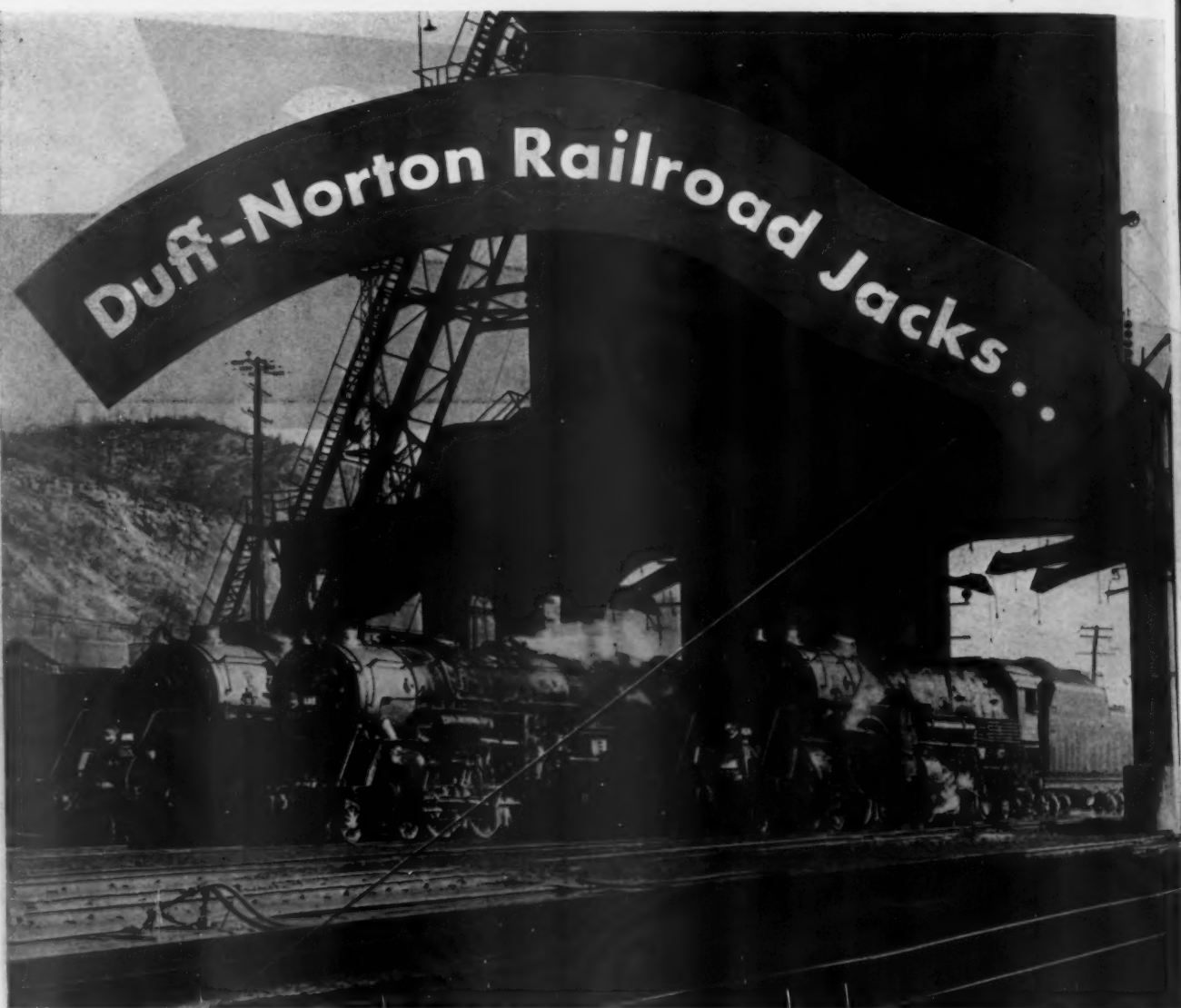


# LIGHTING

**FOR CAR LIGHTING  
AND HEADLIGHTING**  
*See Electric Service*

CO.

Main Office and Laboratories  
**17th and CAMBRIA STREETS, PHILADELPHIA 32, PA.**  
*Branches in Principal Cities*



Norfolk & Western Ry.

## Help speed Locomotive Maintenance

Whether it's inspecting brasses or lifting the heaviest engines, there are husky, sturdy, powerful Duff-Norton Jacks to furnish the "muscles" for the job. Be sure your men always have the right jack for the right job at the right time.

Your nearest Duff-Norton representative will be glad to survey your Jack requirements—*without obligation*. Let him help you keep your wartime Jack stock up to essential requirements—with fast, easy-to-handle Duff-Norton Jacks. Descriptive catalog on request.

**The Duff-Norton Manufacturing Co.**

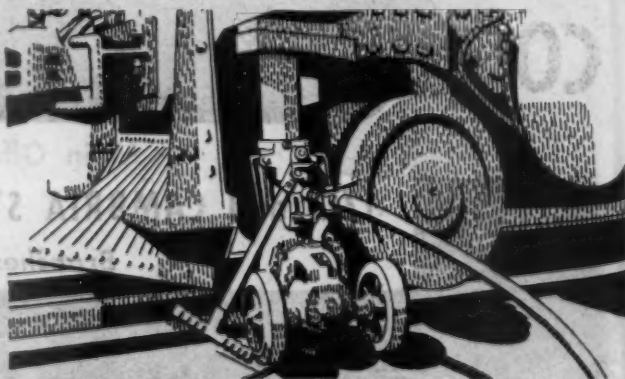
PITTSBURGH, PA.

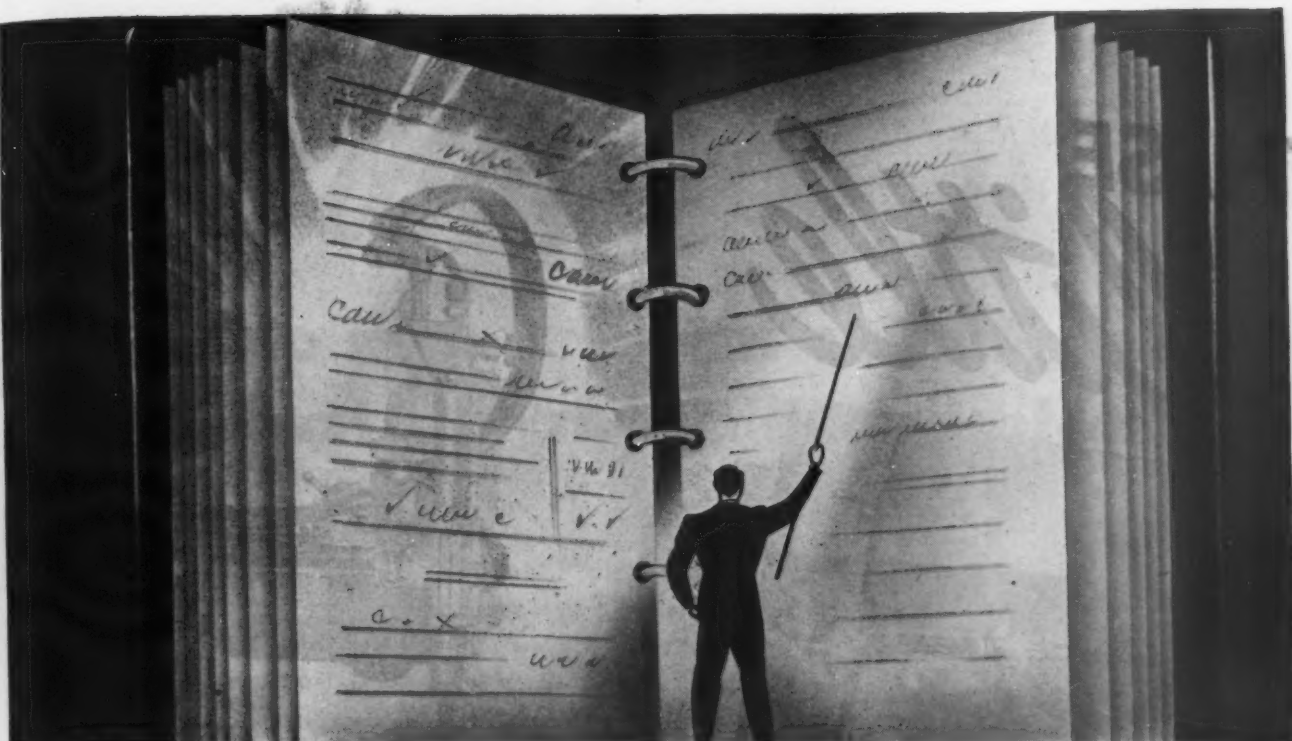
Canadian Plant:  
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Representatives in  
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## Duff-Norton Air Motor Jacks

Five types and sizes of Rotary Air Motor Operated Power Jacks are available for locomotive or car work, in capacities from 20 to 100 tons. Typical of their performance: In a comparison made by a mid-west railroad, under normal operating conditions, pitting manually-operated jacks against Duff-Norton Air Motor Jacks, the Air Motor Jacks saved seven-eighths of the labor cost and one-third of the time.





## ★ TEACHING YOUR COST RECORDS *how to say the* "RIGHT THINGS"

It's one thing to have a cost system that tells facts, accurately and promptly. It's quite another to make sure that your cost records have the right kind of facts to tell—facts you like to be told.

Using Clark Products is a sensible way to "teach cost records how to say the right things"; an effective way to guarantee a pleasant report of ably engineered equipment, built to serve well throughout long and useful lives.

**CLARK EQUIPMENT COMPANY**  
RAILWAY DIVISION • BATTLE CREEK, MICHIGAN

CLARK RAILWAY TRUCK . . . A PROMISE OF MORE COMFORTABLE TRANSPORTATION—SMOOTH, SWIFT, NOISELESS!

CLARK BLIND RIVETS . . . CUTTING ASSEMBLY TIME AND COSTS, REVOLUTIONIZING MANY PHASES OF PRODUCT DESIGN.

CLARK ELECTRIC STEEL CASTINGS . . . OF INTRICATE DESIGN AND VARIED SELECTIONS—OF UNIFORM FINE QUALITY.

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CLARK INDUSTRIAL TRUCKS AND TRACTORS . . . FAST, VERSATILE "DISCOVERERS" OF HUGE SAVINGS.

OTHER PRODUCTS OF CLARK—Metal Spoke Wheels, Front and Rear Axles, Axle Housings, Transmissions, Trailer Axle, Booster Unit, Torque Converter.



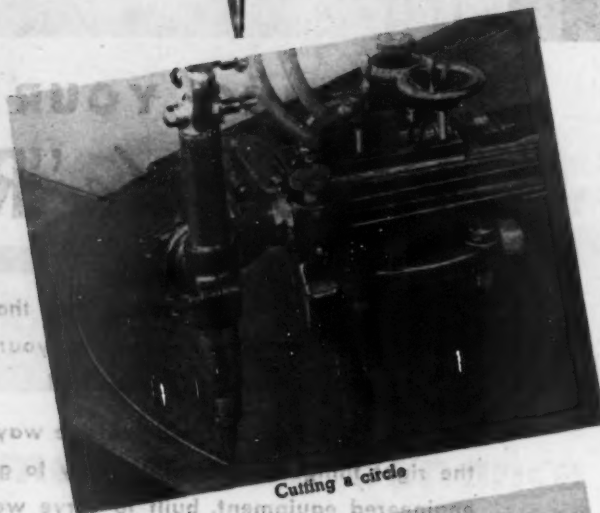
# THESE *little*



Cutting a straight line with straight edge



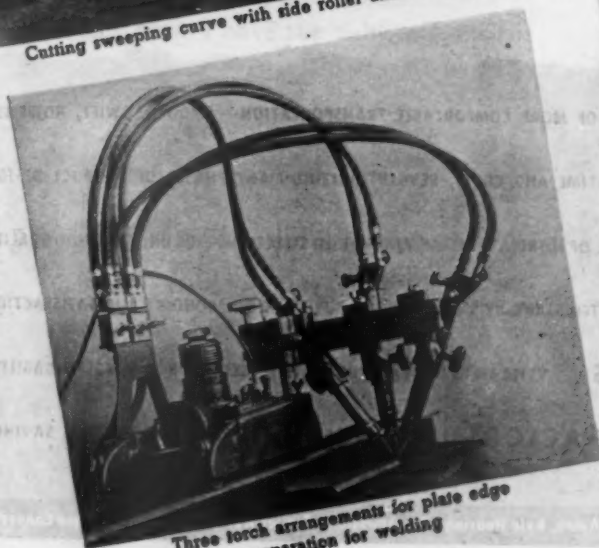
Cutting sweeping curve with side roller attachment



Cutting a circle



Splitting an I-beam with special attachment



Three torch arrangements for plate edge preparation for welding

# Gas

# *fellows..*

## **do many metal cutting jobs faster — more economically**

Need a couple of six foot circles of 1" plate, a few three inch washers? Want to split up a big steel plate and bevel the edges for welding or cut up some structural shapes?

An Airco Radiagraph — one of Airco's small portable gas cutting machines — will do any of these jobs — and many more — and do them faster and more economically.

Operating on steel tracks furnished for five foot cuts, they will make straight cuts of unlimited length in one continuous operation when tracks are progressively positioned.

With an adjustable radius rod and center point, they will cut circles from steel plate of any thickness in a wide range of diameters.

With a side roller attachment and template shaped to guide the machine, long, sweeping curves may be cut.

The torches are adjustable to permit a perpendicular cut or one of any desired bevel. A second torch can be mounted on the machine for the cutting of two parallel straight lines with double

bevel or two concentric circles simultaneously. A third torch can also be mounted on the machine for simultaneously cutting a double bevel with land to prepare plate edges for welding.

A conveniently-located indexed speed control permits the operator to increase or decrease the speed of the machine at will.

Airco Radiagraphs are made in two models, the No. 10 (weight 41 pounds with torch) and the No. 4 (weight 74 pounds with torch). Each machine is available in several speed ranges within the limitations of 2" per minute minimum and 50" maximum for the No. 10's and a minimum of 1½" per minute and a maximum of 75" per minute on the No. 4's. Both models are sturdily-built and dependable.

• For copies of folders containing full details on these two gas cutting machines, ask your nearest Airco office or write Dept. RME, Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.



### **AIR REDUCTION**

OFFICES IN ALL PRINCIPAL CITIES

# *Cutting Machines*

KEEP EQUIPMENT ROLLING WITH...

# Thor ROTARY AIR DRILLS

**POWER...**  
**SPEED...**  
**ECONOMY**

**HOW THOR AIR DRILLS MAINTAIN  
CONSTANT SPEED UNDER  
VARYING LOADS...**



**AIR  
PRESSURE**

Thor's "Air Behind the Blades" principle assures instant starting, prevents dead center positions and provides the fullest utilization of air pressure.

Air pressure behind the edge of the rotor blades, as illustrated above, holds them out against the cylinder bushing wall. This prevents air leakage past the outer edge of the rotor blades when excessive loads slow the drill speed.

A control valve governed by rotor speed prevents racing . . . even when the throttle is wide open and the drill is running free.

Solid one-piece construction of rotor permits the use of deeper slots and wide blades. This steps up power performance under all conditions and increases the useful life of the tool.



Branches in Principal Cities



(Above) No. 377RY close-corner drill—  
one of 10 Thor right-angle drills.

where there is maintenance work to be done—in railroad shops or elsewhere—Thor Rotary Pneumatic Drills and other Thor air-driven tools are popular for their ease and convenience of handling . . . plus their great capacity to get more and better work done faster, more economically. Thor tools have a fifty year record of dependable performance and stamina . . . their advanced design assures peak efficiency under all operating conditions.

Every quality that you might demand is found in Thor air tools . . . maximum power—lightweight—perfect balance—instant starting—smooth operation under load—automatic lubrication—and positive power control at all times. For complete information, write for Thor Pneumatic Tool Catalog No. 52B.

**INDEPENDENT PNEUMATIC TOOL CO.**

600 W. Jackson Blvd., Chicago 6, Illinois

New York

Los Angeles



No. 360 Air Grinder—For the heaviest type of production grinding . . . rugged, well balanced, powerful. One of 52 Sizes.

No. 385-X 2" cap. Straight drill. One of 26 models in capacities from 1/8" to 3"—Reversible and non-Reversible types.

No. 100 Chipping Hammer—One of a full selection of chipping hammers that find many uses in railroad maintenance work.

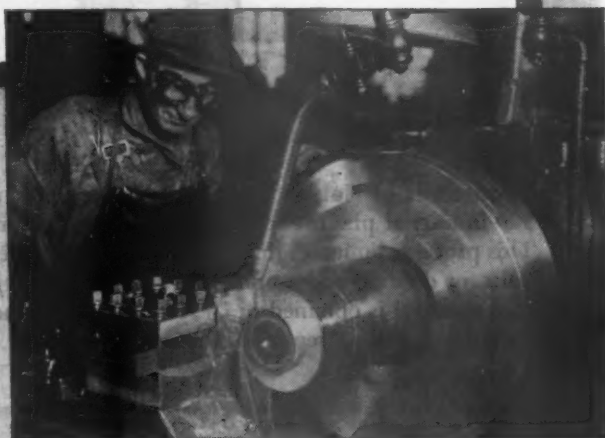


# Machining time cut 45%

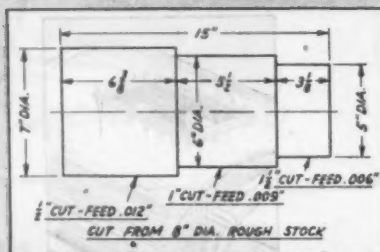
## ON LOCOMOTIVE CRANK PINS

DAILY, in railroad shops all over the country, Warner & Swasey Turret Lathes are making possible great time savings. For example, in a large eastern railroad shop, Warner & Swasey efficiency has cut machining time on Locomotive Crank Pins 45%. The Pins are made in small lots from 8-inch axle stock. On the new Warner & Swasey 4-A Heavy-Duty Turret Lathe shown at the right, they were machined in about half the time of the former method. Comparable savings on a wide variety of railroad jobs are typical, not unusual.

Warner & Swaseys, using a universal tooling setup in taking multiple and combined cuts on many railroad turning jobs, save machining time. They have the power, accuracy, and rigidity to do every job well. Their flexibility puts a run of one piece or a thousand pieces on a low cost production basis. If you want faster, more accurate production, with less effort and at lower maintenance cost . . . put it on the Warner & Swasey.



• This Warner & Swasey 4-A Heavy-Duty Turret Lathe reduces turning time 45% over former methods in machining Locomotive Crank Pins.



Combined cuts taken from the hexagon turret and the cross slide at the same time greatly reduce machining time on railroad jobs. Standard tooling not only results in time savings on individual pieces, but the ability to change quickly from job to job saves setup time, too.

### WRITE FOR YOUR COPY



The Warner & Swasey Turret Lathe Tool Catalog fully describes 396 turret lathe tools and their application. This 176 page book contains the most complete data, together with illustrations, ever compiled on the subject of turret lathe tools. Free copy on request.



YOU CAN MACHINE IT BETTER.

FASTER, FOR LESS... WITH A WARNER & SWASEY

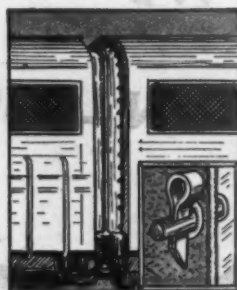
TURRET LATHES, SADDLE AND RAM TYPES — CHUCKING AND BAR TOOLS — PRECISION TAPPING AND THREADING MACHINES

# Here are a few of the ways thousands of Nelson Stud Welders are used . . .

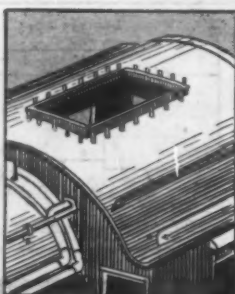
*Cutaway view of welded Nelson Stud (after etching with Nital).*



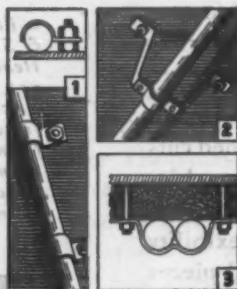
Thousands of Nelson Stud Welders are now used by more than 500 industrial plants and shipyards in applications similar to these. This process eliminates time and material consumed in hand-welding bolts, or drilling and tapping for studs. The complete fusion of the stud to metal is obtained in  $\frac{1}{2}$  second . . . and the resulting weld is stronger than the strength of the stud!



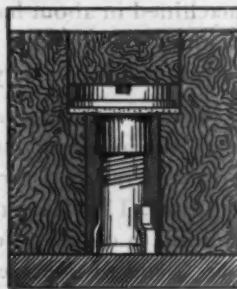
**Locomotive "Storm Curtains"** or diaphragms are secured with the Lagging Stud and a special locking pin. The result is a strong, rapidly installed job on diesel locomotive units. These curtains are quickly removed when desired, yet are securely held in place by the end-welded studs.



Locomotive ventilator covers are typical of the many parts on a railroad locomotive that may be secured with Nelson Studs. Oil lines, flooring, lagging materials, curtains, etc., are a few of the applications. The elimination of drilling holes for studs or bolts is saving many hours in locomotive construction, repair, and maintenance.



**Wiring, conduit, and pipe** are quickly secured. Illustrated above are a few of the many methods used: 1. Securing conduit. 2. Securing pipe (single or multiple runs). 3. Securing wiring of all kinds over insulation materials.



**Wood flooring** is secured over metal beams with Nelson Studs. The flooring is laid and the holes drilled where desired. The studs are then welded through the holes and nuts and washers are tightened down. A wooden plug is then tapped into the hole to complete the job.



*The Nelson Electric Arc Stud Welder*

For complete details and catalog, write:

**NELSON SPECIALTY  
WELDING EQUIPMENT CORPORATION**

Dept. R, 440 Peralta Ave., San Leandro, Calif.

Eastern Representative: Camden Stud Welding Corp.  
Dept. 122, 1416 South Sixth St., Camden, N. J.

## NELSON STUD WELDERS & STUDS

# CUTTING NEW HIGH-SPEED FIGURES



## STAR-MO M-2

*Improved* TUNGSTEN-"MOLY" HIGH-SPEED STEEL

Firth-Sterling's Star-Mo M-2 displays all the advantages looked for in a modern high-speed steel for general use.

It out-classes the old traditional 18-4-1 steels in all important points: it out-cuts and out-lasts, assuring bigger, more consistent production; it performs with ease. All this at a lower cost.

No wonder Star-Mo M-2 wins the acclaim of an ever-growing list of tool makers and automotive manufacturers. They know a headliner when they see one perform. Your shop will be convinced too with a Star-Mo M-2 workout.

**Firth-Sterling**  
STEEL COMPANY



*Better*

outcuts and outlasts 18-4-1

*Costs Less*

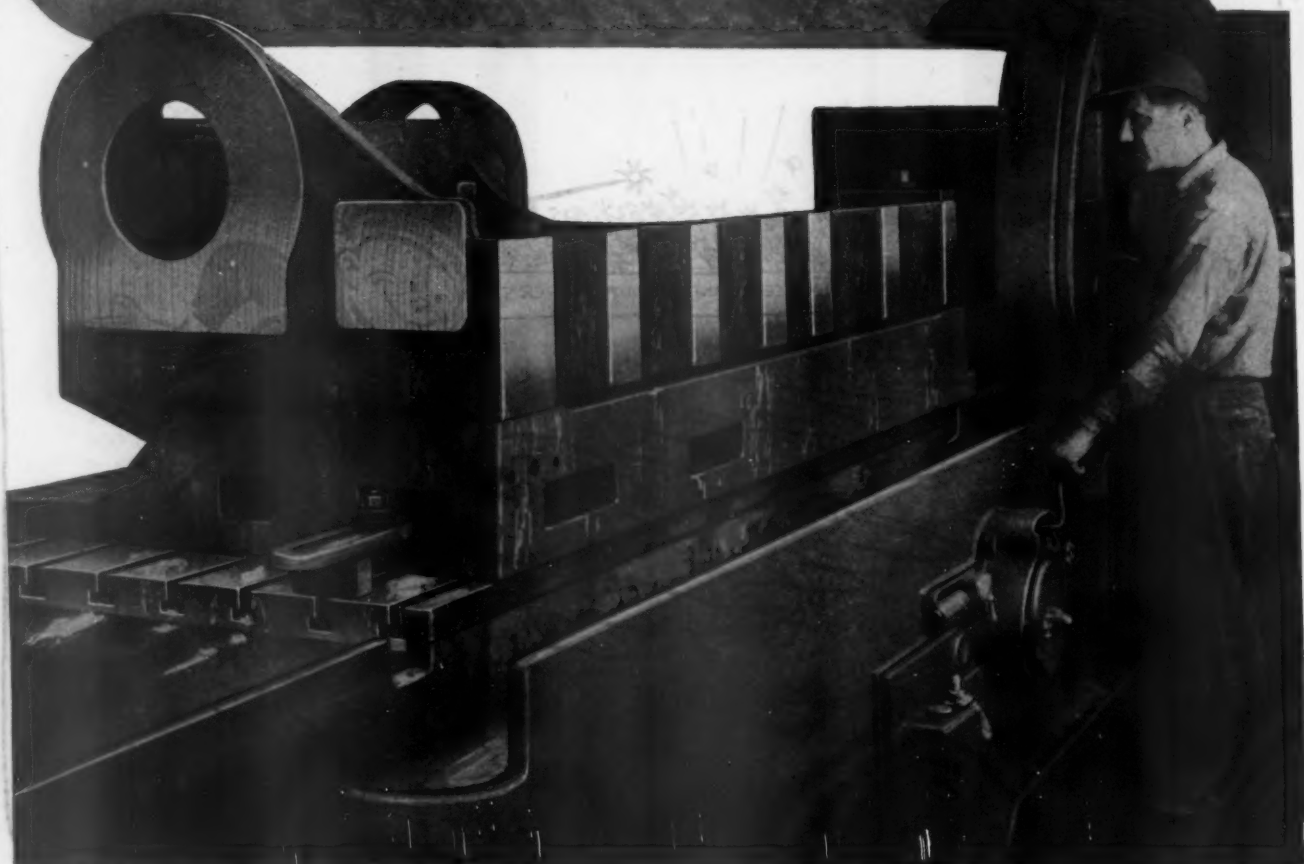
approximately 20% less

*Easy to Handle*

ask our representative



## HOW TO BEAT YOUR LEAST TIME FOR MACHINING THIS PIECE



Can you spare a couple of minutes to estimate the least time it would require to machine this piece? Areas  $84'' \times 9\frac{1}{2}''$  and  $21\frac{1}{4}'' \times 29\frac{1}{2}''$ . It's a fussy job—the two sides shown must be  $90^\circ$  square with each other and both must be  $90^\circ$  square with the horizontal. What's your answer?

Now look at the time for face grinding the same piece—150 minutes floor-to-floor.

For a job like this, and for many a job you have, face grinding is often the only justifiable method. Write for Bulletin 44-G today and see how to save time and material by face grinding.

**MAIL TODAY FOR NEW FOLDER**

Diamond Machine Company of Philadelphia  
2510 Aramingo Avenue, Philadelphia 25, Pa.

Gentlemen: Please send me promptly your Bulletin 44-G which shows how to speed-up production with the Diamond Face Grinder.

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_ State \_\_\_\_\_  
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"THE DIAMOND



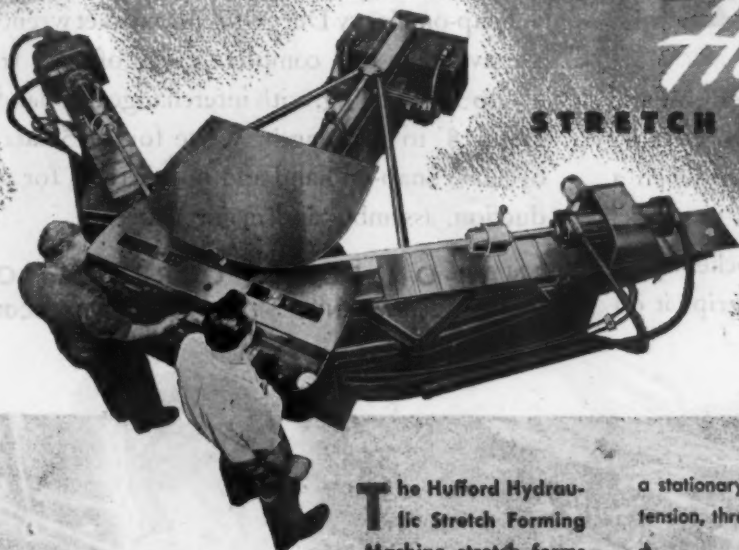
THAT CUTS YOUR COSTS"

**DIAMOND**  
MACHINE COMPANY  
OF PHILADELPHIA

# **STRETCH FORM** **BETTER PARTS FASTER** with the **HUFFORD**

*Hydraulic*

**STRETCH FORMING MACHINE**



**T**he Hufford Hydraulic Stretch Forming Machine stretch-forms extrusions, rolled stock and narrow sheet stock of many materials to precise contours without wrinkling or springback, and with absolute uniformity of physical and dimensional characteristics!

Operating cycle is automatic once started and unloading is accomplished automatically, saving valuable operating time. Production increases to 300% with a 30% saving in manpower are reported by leading aircraft manufacturers.

## **SOLVES STRETCH FORMING PROBLEMS**

The Hufford patented method under which the machine operates overcomes many of the problems encountered in this work, because it forms the metal in a natural manner. By stretching the work from both ends, and forming it around

a stationary die or form block while still under equalized tension, three important advantages are achieved:

- ◆ Maintenance of uniform physical properties.
- ◆ Elimination of differences in cross sectional dimensions.
- ◆ Reduction of springback, elimination of wrinkling.

There are many other advantages, as well. Equal tension over the full workpiece length eliminates localized strains during bending... work-hardening is uniformly distributed... duplication of parts is always uniform.

The Hufford Stretch Forming Machine is shipped complete, ready for operation. No special foundation or installation work is required. Full hydraulic operation—Vickers equipment throughout. Delivery—60 to 90 days.

Write—today—for illustrated folder B-2 describing the machine in detail, illustrating dies, form blocks, types of parts produced, and giving specifications.

**HUFFORD MACHINE WORKS**

201 NORTH BROADWAY, REDONDO BEACH, CALIFORNIA

**STRETCH FORMING MACHINE**



# For the biggest nut-turning jobs HERE'S SUPER-POWER... *with* SAFETY!

Set big nuts down *solidly*... with "beef", muscle and powerful leverage! Or break frozen ones loose instantly — there's *performance* when a Snap-on Heavy Duty Boxocket goes to work!

Performance plus *safety*! The boxocket opening completely encircles the nut... grips it on

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Snap-on Heavy Duty Offset Boxocket wrenches are available in a complete range of sizes from 1½" to 3½" opening, with interchangeable handles from 18" to 36" length. Write for 1945 catalog of 3,000 Snap-on hand and power tools for production, assembly and maintenance.

**SNAP-ON TOOLS CORPORATION**  
8058-D 28th AVENUE KENOSHA, WISCONSIN





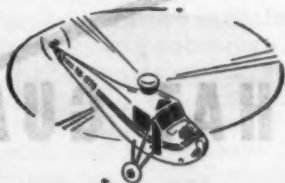
... "With Tolerances  
This Close, it's a job for  
Aeronautical Products."



**W**RITE and tell us any problems you may have on precision parts. Here, in one organization with two great plants, are ALL the facilities the most complex production problem requires . . . from engineering skill through all phases of machining. Long before the war, our

performance earned top rating in the industry. We've "come through" under total war output . . . and we intend to stay at the top after Victory! We may have an open capacity on your requirements now. Ask our Executive Sales Office to mail you a booklet covering our *complete* plant facilities.

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● *THE SUCCESS of the Aeronautical Products, Inc. Helicopter, designed and built by our own craftsmen, promises new accomplishments in the post-war age of flight.*

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**BUT KEEP THAT GUARD UP!**

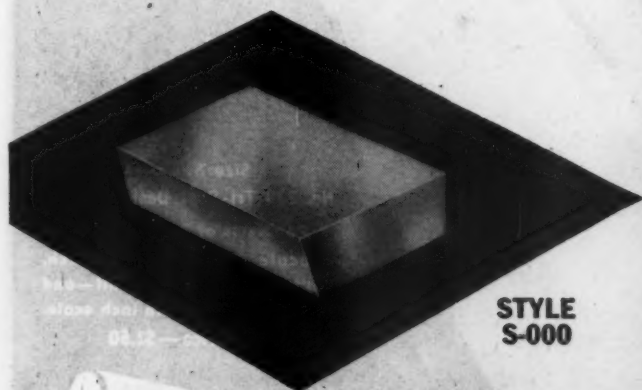
PRODUCERS OF HAMILTON STEAM AND DIESEL ENGINES,  
CANNON AND MACHINE TOOLS



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THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

# New KENNAMETAL "Universal" BLANKS



STYLE  
S-000

## FACILITATE TOOL MAKING

*and Keep Stocks Down!*

These new Kennametal "Universal" tool blanks are literally "jacks-of-all-trades." Rectangular in shape, with 12° clearance angle formed on one long edge, they can be used to make many different types of tools, simply by setting them into open-end recesses, as illustrated. They are available in all recognized standard sizes, many of which are stocked in several grades.

Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a widespread, yet economical scale, the advantages of Kennametal—its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

Catalog particulars, and prices,  
are yours for the asking.

**KENNAMETAL**

SUPERIOR CEMENTED CARBIDES

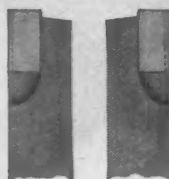
KENNAMETAL Inc., LATROBE, PA.

ONE STYLE TOOL BLANK

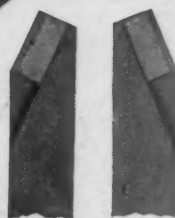


FOR ALL THESE IDEAS

STRAIGHT  
TURNING TOOLS



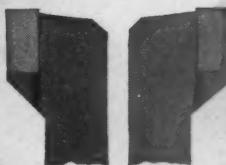
TURNING TOOLS



OFFSET TOOLS



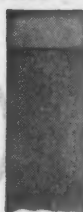
OFFSET  
TURNING TOOLS



FACING TOOLS



SQUARE NOSE  
TOOLS





ONE PAD WITH 6 SCALE COMBINATIONS



Size 8 1/2 x 11

No. 370 Tri-Post Designer's Pad

75 sheets of Tracing Paper

6 Scale Combinations: inch, tenth, eighth, quarter, half—and isometric with eighth inch scale.

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# OLIVER CAR BUILDER'S FASTENERS

SPECIALIZED FOR EVERY NEED

Bolts and fasteners of all types specially designed for railroad car and locomotive work and made by Oliver are illustrated here. Manufactured to meet the exacting specifications and service requirements of the railroads, Oliver fasteners are always your best choice.

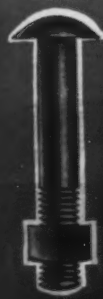
**OLIVER**  
IRON AND STEEL  
*Corporation*

SOUTH TENTH AND MURIEL STREETS  
PITTSBURGH 3, PENNA.

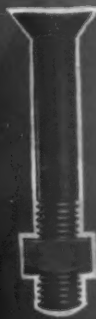
Makers of Bolts, Nuts, Rivets and other headed and threaded products



**Rivets, Too—**  
Oliver offers a complete line of railroad rivets—accurately made of uniformly high quality.



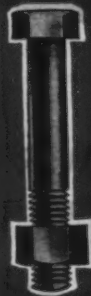
Hex Head Bolt



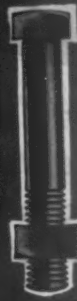
Hex Head Bolt



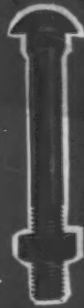
Hex Head Bolt



Hex Head Bolt



Hex Head Bolt



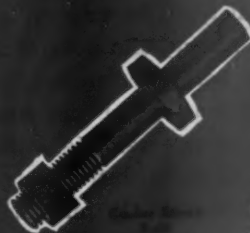
Hex Head Bolt



Hex Head Bolt



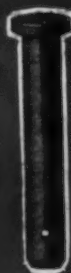
Hex Head Bolt



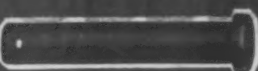
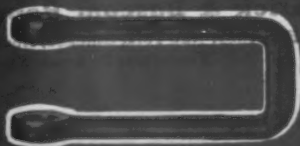
Hex Head Bolt



Hex Head Bolt



Hex Head Bolt



Hex Head Bolt

## How to Get Help on 2 SLING Problems

- Save TIME
  - Save MANPOWER
- on both shop and  
derrick lifts

Picking up a piston rod in the shop and righting a heavy locomotive with a wrecking derrick are two extremes in lifts. Yet both jobs—and scores of others—can be speeded with Yellow Strand Braided Safety Slings.\* For these adaptable wire rope slings, properly fitted for the kind of hitch desired, are easily handled, quickly attached and detached. Their patented braiding increases flexibility . . . cuts down the tendency to kink . . . promotes security for men and loads.

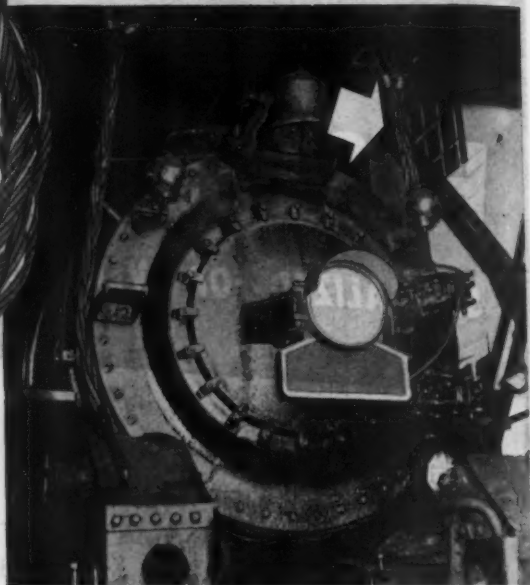
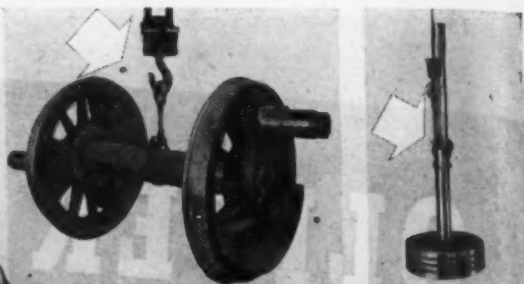
Since Yellow Strand Braided Slings weigh much less than the traditional type, fewer men are needed to work with them. Annealing and normalizing operations are also saved. Leading railroads are using braided slings to lift steam, Diesel and electric locomotives, super-heaters, truck assemblies, wheels, rims, journal boxes and rods; to move obstructions, to handle derailed cars by the drawbar, to pull in and hoist damaged units. Durable Yellow Strand Braided Slings will help you return equipment to service faster. Write now for information.

**Broderick & Bascom Rope Co., Saint Louis**

Branches: New York, Chicago, Houston, Portland, Seattle  
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# YELLOW STRAND

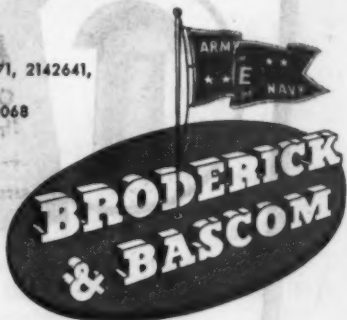
## Braided Wire Rope SAFETY SLINGS



**Riggers' Hand Book**—Shows sling types, fittings, capacities. Send for FREE copy.

\*Patents:

U. S., 1475859, 1524671, 2142641,  
2142642, 2299568;  
Canadian, 252874, 258068





# **ADJUSTABLE CUTTING TOOLS**



Adjustability is but one of many advantages which make Clark Cutting Tools outstanding in their field. Each has a wide range of uses and does the work of several other tools, thereby saving time and greatly reducing tool inventory costs. Improved design, balanced construction, and proper heat treating mean fast, chatterless operation. Good machinists *everywhere* are demanding Clark Adjustable Cutting Tools because they're easier to use and give longer service.

For complete information, call your Clark Cutter Jobber today, or write for catalog RME-4-CT.

## CLARK PRECISION LEVER-LOCK BORING BARS



Sizes down to  $\frac{3}{16}$ " diameter. Entirely eliminate use of solid forged bars. One precision ground thread tool bit and one boring bit furnished with each bar. 15° holding channel in one end, right angle channel in other. Full clearance to bore or thread to bottom of blind hole. Set consists of  $\frac{3}{16}$ ",  $\frac{1}{4}$ ",  $\frac{3}{8}$ " and  $\frac{1}{2}$ " bars.

## CLARK ADJUSTABLE TOOL HOLDER

Exclusive vise-grip jaw runs the full length of the cutter channel... has twice the width and five times the length of the bearing surface found in other tool holders. Accommodates many sizes of tool bits of all shapes and types. Tilted head gives operator unobstructed view of cutting edge. Complete range of shank sizes with standard 15° cutter channel for high speed bits or parallel channel type for carbide tool bits, right and left hand offset.

## CLARK ADJUSTABLE COUNTERBORES



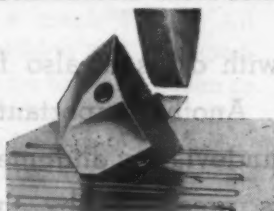
Each does the work of 7 or more fixed-radius cutters. 9 sizes cut all fractional diameters from  $\frac{1}{4}$ " to  $5\frac{1}{2}$ ". Removable blades are easy to sharpen. Exclusive, burr-preventing interchangeable pilots available from  $\frac{3}{16}$ " up, by sixteenths.

## CLARK ADJUSTABLE HOLE CUTTERS



Give finished cuts the first time in boiler plate, pipe, plastics, hard fibre, stainless steel, Transite, and other problem materials. Models cover variable expansions from  $\frac{1}{4}$ " to 5" holes and have thickness capacities from thin sheets to 1". Used in drill presses, pneumatic motors, electric drills, milling machines and lathes.

## CLARK THREAD TOOL GRINDING FIXTURE

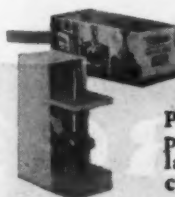


One fixture handles both National 60° and Acme 29° left or right hand thread tool bits. No graduated scales or moving parts to wear out. Two sizes—Model A for mechanic's tool kit; Model B for shop—Adapters included.

## CLARK ADJUSTABLE FACE MILLING CUTTERS



4 sizes provide adjustable widths of cuts from  $1\frac{1}{4}$ " to 5". Easy to sharpen or to quickly adjust. Ideal as an emergency repair tool, for dressing castings of any metal, for cutting slots and keyways, and many other end mill, facing mill, cutter and slab mill operations.



**BUILT RIGHT — PACKAGED RIGHT**  
Properly blocked to prevent damage—labeled and color-coded.

CLARK  CUTTERS

*Robert H. Clark Company*

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BEVERLY HILLS, CALIFORNIA

## CLARK ADJUSTABLE FLY CUTTER

2 models cut holes within 2K" up to 10" range, to 1" thick. Heat-treated shank. Removable pilot.



**ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS**



# The Most Versatile Single Frame Hammer

Designed especially for a wider range of work than the usual single frame forging hammer, the Chambersburg High Frame Hammer is proving itself a most versatile tool in many shops.

**B**ECAUSE of its high frame and greater working space, it is now possible to forge large discs and rings, to upset high stems, form arch bars, etc. on the most economical size of tool. Long punching

with drifts is also facilitated.

Another important feature is undeviating alignment, which is preserved by the guides being supported on 5 sides, and by the tie-bar across the frames.



CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



## CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES

# "Bumblebee" performance

**W**HATEVER your welding problem — on production lines, or special jobs — there's a Wilson "Bumblebee" A.C. Arc Welder that's just suited to your needs . . . designed to do the work faster, better, with lower power consumption.

"Bumblebees" are now made in five sizes, all embodying characteristic "Bumblebee" efficiency, economy and dependability: (1) The new 200 ampere "Bumblebee" for light, odd-job or production welding; (2) the 300 ampere, and (3) the 500 ampere "Bumblebee" for heavy all-purpose assignments; and (4 and 5) the 750 and 1000 ampere sizes available on special order. The 300 and 500 ampere sizes are available in "All-Weather" models for welding under conditions where excessive moisture is encountered.

Throughout industry the many important features of the "Bumblebee" have made them a widespread choice among owners and operators. With their deep penetrating arc and excellent arc characteristics, they permit more welding production per work day — of better quality, with considerably lower power costs.

Light, well balanced, rugged, they provide continuous, step-less current control, from maximum to minimum—simply by turning a crank on top. All "live" parts are completely shielded and protected.

• See your nearest Airco office for full information or write Dept. RME for catalog. Address Air Reduction, General Offices: 60 East 42nd Street, New York 17, N.Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

**AIR REDUCTION**

Offices in all Principal Cities



New 200 Ampere  
"Bumblebee"



All-Weather  
Model  
300 and 500  
Ampere Sizes



**WILSON**  
**"Bumblebee"**

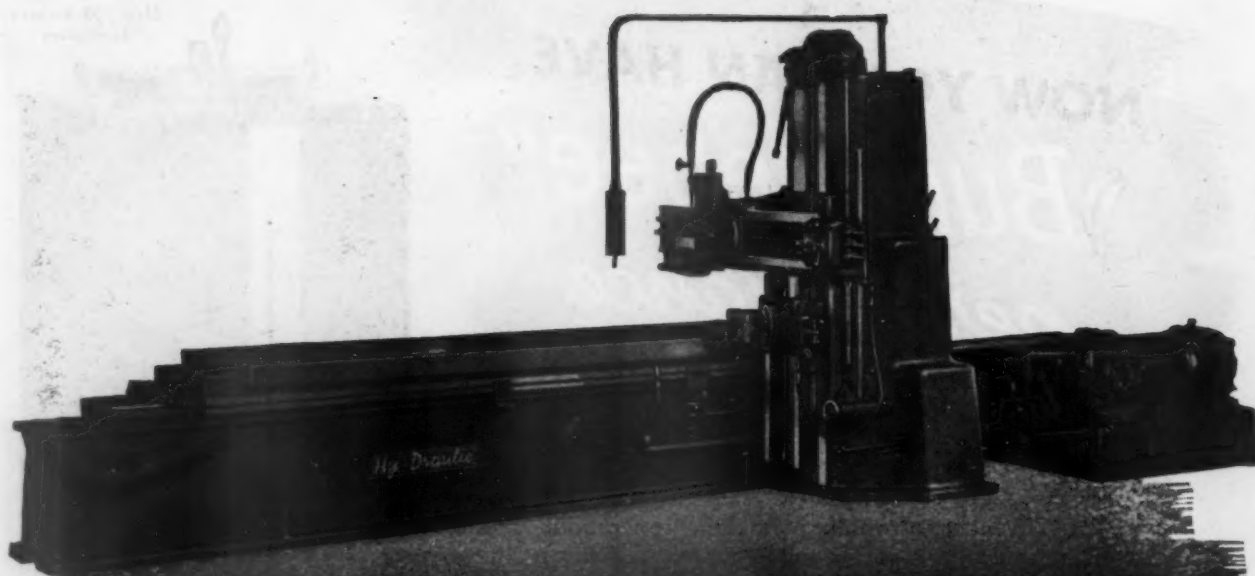
**AC**

**ARC WELDERS**

with the penetrating, stinging arc

A COMPLETE LINE OF A.C., D.C. AND GAS-ENGINE DRIVEN UNITS





**Hy-Draulic**

## SHAPER-PLANERS

**HAVE THE EXACT SPEEDS AND FEEDS YOU NEED FOR THAT WORK YOU WANT TO DO FAST.**

Cutting speeds and feeds are quickly and infinitely adjustable, within specified limits, in Rockford Hy-Draulic Shaper-Planers. There's every convenience for quick set-up and easy operation. Cutting pressure is uniform throughout each chip thus working cutting tools to maximum capacity. Table returns "on the double" after a smooth shockless reverse.

Maintenance is simple and easy in the Rockford Hy-Draulic Shaper-Planer. Tool cost is very low. Easy operation saves

time, manpower and horsepower. Because the drive is *hydraulic*, the Shaper-Planer table cannot slide off the bed and cause damage, and it can stall under cut without harm to cutting tool or machine.

There's a wide field of planning in which the Hy-Draulic Shaper-Planer is unbeatable for getting out accurate work fast. Write today for details.

Ask for Bulletin 1918.



4501

**ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS**



# 50 YEARS AGO



The original employees of The Champion Rivet Co. prior to 1900. Mr. David J. Champion, founder, is at extreme left wearing derby hat.

## Today BOTH ARE STILL GOING STRONG

The manufacture of **VICTOR** brand steel and iron rivets was begun by The Champion Rivet Co. in April, 1895. At that time the unique trade-mark featuring the elephant and the Devil vainly pulling on opposite ends of a Victor boiler rivet was created. The Strength which this strange pair typified has always been the chief characteristic of Champion rivets and half a century later they are still tugging with all their might.

In 1931 a line of **CHAMPION WELDING ELECTRODES** which won the immediate recognition of engineers and fabricators was introduced. Here again the Devil played a prominent role in the naming of the various rods and the design of the electrode trade-mark shown at left.



**The CHAMPION RIVET Co.**  
11600 HARVARD AVENUE • CLEVELAND, OHIO  
*East Chicago, Ind.*



# WALWORTH

## Pipe Fittings

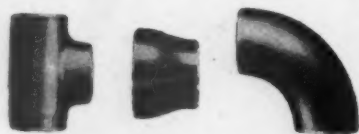
A complete line of standardized types in

### STEEL

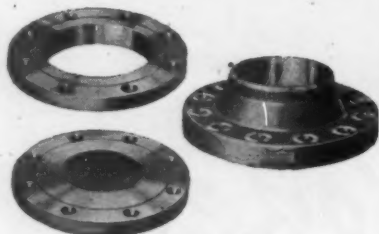
in series 150 to 1500



Cast Steel Fittings

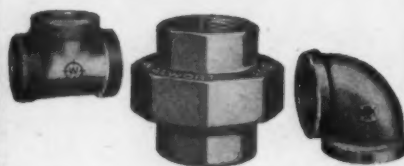


Steel Welding Fittings



Forged Steel Flanges

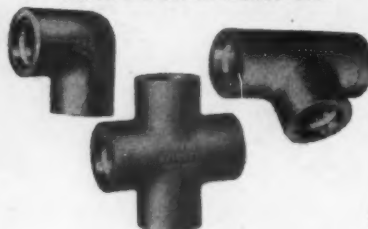
### BRONZE



125 Lb and 250 Lb, Screwed ends



150 Lb and 300 Lb Walseal ends



3,000 Lb O.W.Gr., Walseal ends

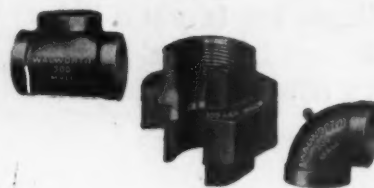
### IRON



125 Lb and 250 Lb Cast Iron



150 Lb Malleable Iron



300 Lb Malleable Iron

Walworth's comprehensive line of pipe fittings is made in a wide range of types and sizes to meet every piping requirement. A few of the many regular Walworth fittings are illustrated above. All Walworth fittings are made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, they reflect Walworth's 103 years' experience in the manufacture of quality valves and fittings.

For detailed information on Walworth's complete line of valves, fittings, and pipe wrenches, see your local Walworth distributor or write for a free copy of Catalog 42.



12 AWARDS  
TO 4 PLANTS

## WALWORTH

valves AND fittings

60 EAST 42nd ST., NEW YORK 17, N. Y.

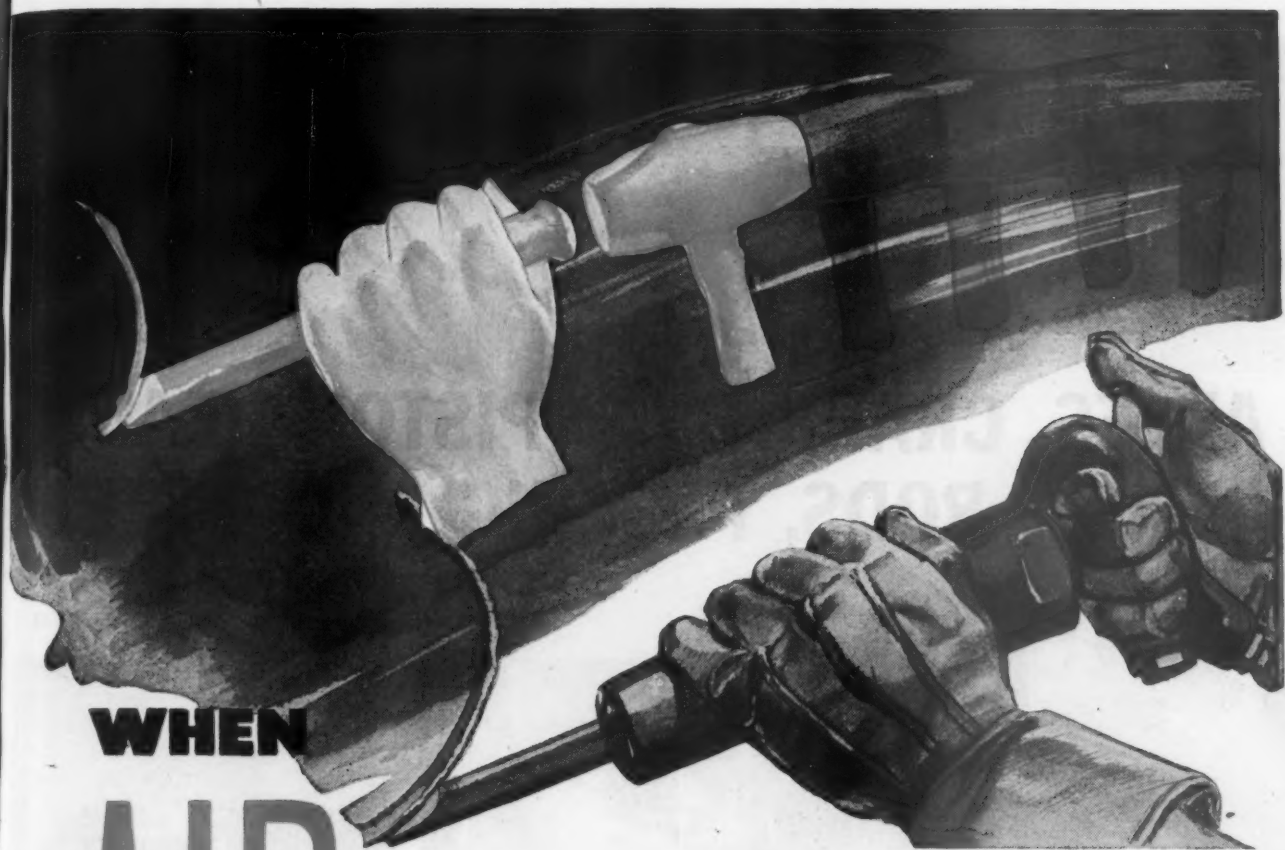
### LABORATORY CONTROL



To assure strict adherence to specifications, sample test bars of the metals from which Walworth Pipe Fittings are made are subjected to regular testing in Walworth laboratories. These and other regular controls and inspections assure the high quality of all Walworth Pipe Fittings. The illustration shows a test on a cast iron transverse bar.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD





**WHEN**  
**AIR**

## **POWERS THE HAMMER**

Each blow is uniform throughout the day and production is increased when air hammers do the work. These tools are popular with workers because they are light in weight and easy to hold. This means that fatigue is kept at a minimum and the operator can produce more work with less effort.

Years of continual research and improvement have enabled us to produce many types and sizes of hand-held air tools. In addition to air hammers for chipping, scaling, riveting, digging, tamping, etc., we have a complete line of air drills, reamers, wrenches, grinders, etc. They are all favorites. When you buy an I-R air tool you get one that is powerful, durable, safe, and easy to hold.

Consult our nearest office for recommendations on the proper tool for the job.

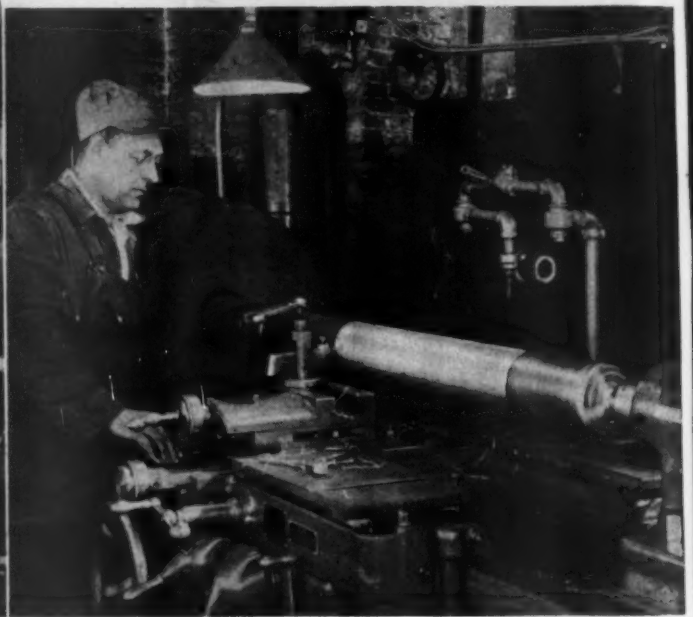
# **Ingersoll-Rand**

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • OIL AND GAS ENGINES • CONDENSERS • CENTRIFUGAL PUMPS

# L & S Lathes

**AXLES, CRANK PINS, PISTON HEADS,  
PISTON RODS, PACKING AND OTHER  
LATHE JOBS . . .**



**D**ESIGNED to meet tomorrow's needs as well as today's requirements L & S Lathes are making a big "hit" in many leading railroad shops.

Installations in railroad service are making records in the production of many locomotive parts. These installations are located in engine terminals as well as the back shops.

Axles, crank pins, piston rods, bushings, valve

rings, valve motion parts, bolts, pins and all other lathe jobs cost less when machined on L & S Lathes.

The L & S Line includes a wide range of Engine Lathes, Tool room Lathes, Manufacturing Lathes, Gap Lathes and Large Hole through Spindle Lathes with various attachments to suit your specific requirements.

**THE LODGE & SHIPLEY MACHINE TOOL CO.**

**CINCINNATI, 25, OHIO, U. S. A.**

**ENGINE  
AUTOMATIC  
TOOL ROOM  
OIL COUNTRY  
LATHES**



# PUT 'EM TOGETHER QUICK!



## WITH WELLS' *Stubby* ELECTRODE HOLDER

Whether your job is welding the keel of a Liberty ship or repairing small equipment, Martin Wells' *Stubby* electrode holder does the job quickly, easily, and economically.

*Stubby* is popular with maintenance superintendents because its time is spent *on the job, not in the repair shop*. It is practically indestructible—the insulator cap is the only part that requires replacement and it can be changed right on the job.

*Stubby* fits more jobs, is a general purpose holder for all operations using 300 amps., is particularly adapted to close-quarter work.

*Stubby* is liked by the weldor because it's lightweight, perfectly balanced, has no springs to tire the hand. Rods can be changed *quick as a wink*, right on the job.



MODEL  
3RS  
300 Amp.

Exclusive Manufacturer

### Martin Wells

5886 Compton Ave.,  
Los Angeles 1, California

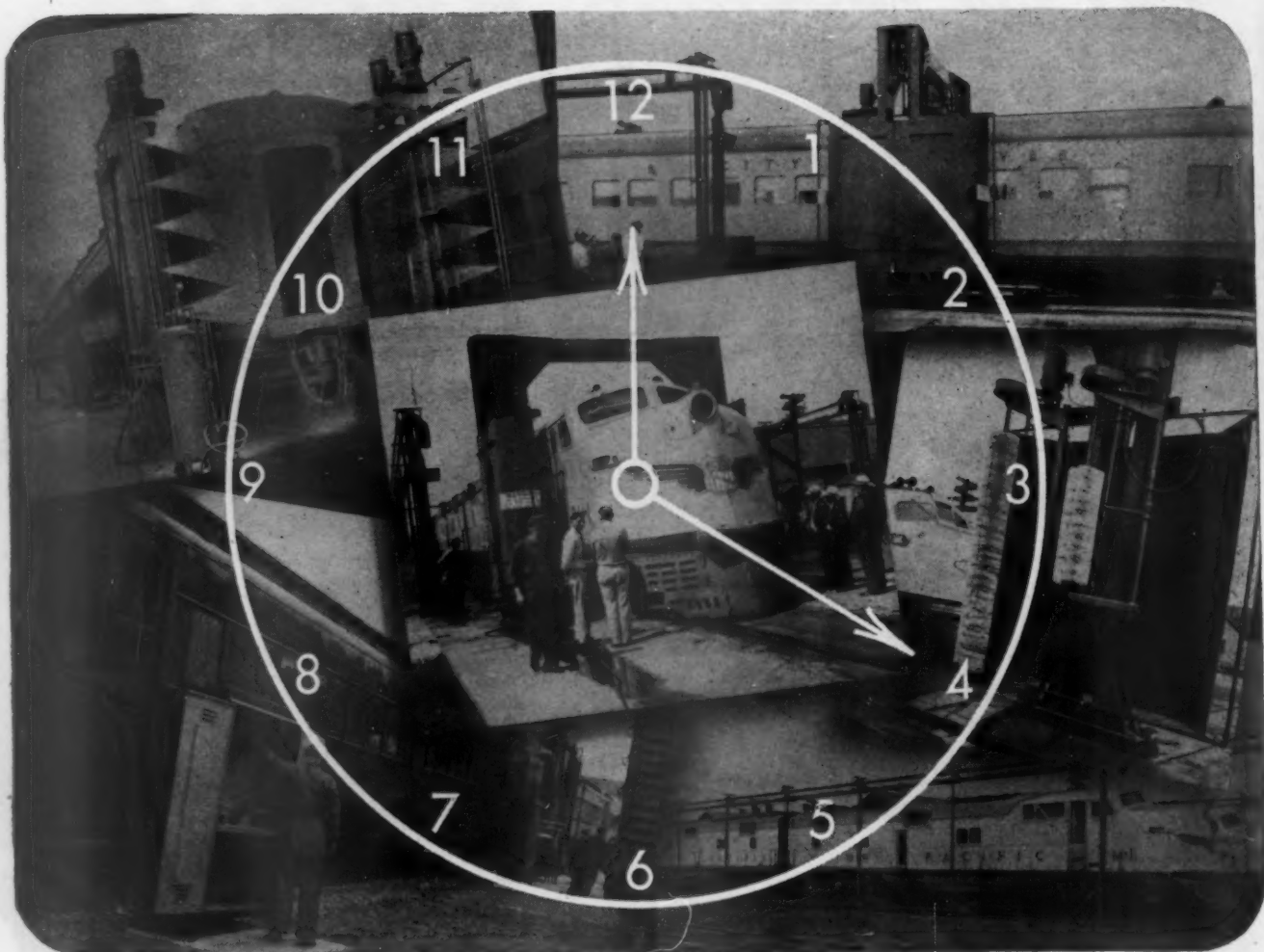
BAY CITY — Southern Supply Company  
BIRMINGHAM — J. E. & S. Co., Inc.  
CHICAGO — J. E. & S. Co., Inc.  
CINCINNATI — J. E. & S. Co., Inc.  
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AIR REDUCTION SALES CO. • OFFICES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES





Photos courtesy of the Pennsylvania Railroad



Pennsylvania Railroad two-unit installation. Railroad officials say it enables a crew of 10 to clean 250 coaches a day, whereas the same job took the crew 40 days when done by hand.



Washer at work, with both units functioning. Cars move from right to left, being sprayed with cleaning solution by the first unit and with a water rinse by the unit shown.

## Maintain schedules with clean cars

### SAVE 75% IN LABOR AND WASHING TIME

Averaging a speed of 80 feet per minute, Whiting washers help meet problems of labor shortages and heavy demands on equipment. Handling up to 300 coaches in an eight-hour shift, they save 75% in time and labor, cut washing costs in half. They are also adaptable for locomotive tenders and Diesel-electric locomotives.

Whiting washers preserve car finishes by using water alone, or—for extremely dirty cars—cleaning solution and a carefully-timed water rinse. Self-aligning brushes that compensate for car tilt assure thorough cleaning, and reversible control permits cars to be run through from either end without delay.

Single and multiple unit installations are available for handling coaches, tenders, locomotives, trackless trolleys, trucks, and buses. Write for information.

# WHITING

## CORPORATION

15609 Lathrop Avenue, Harvey, Illinois

### RAILROAD MAINTENANCE EQUIPMENT

DROP PIT TABLES • LOCOMOTIVE HOISTS • HIGH-LIFT JACKS • LOCOMOTIVE SPOTTERS  
CAR WASHERS • CINDER CONVEYORS • TRANSFER TABLES • CROSSOVER BRIDGES

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Washington, D. C. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario.

*How many hands does a  
turret lathe operator need?*



*— only two ... if it's a Jones & Lamson*



Many a turret lathe operator must have wished, at times, that he were like the six-armed deity of the Hindus, for faster-cutting tools have greatly increased the productivity of these machines and the burden upon the operator. The necessity for simplified controls to save waste motion and operator fatigue is, therefore, imperative!

Jones & Lamson Universal Turret Lathes are designed not only to take full advantage of the fastest-cutting tools, but also to give every mechanical aid to the operator so that he can operate to the maximum capacity of the machine without undue fatigue.

We show here some of the man-saving, time-saving features built into these machines. Write to us for more detailed information and descriptive literature.

#### SINGLE LEVER SPINDLE SPEED SELECTOR

With direct reading dial, to control all spindle speeds. Next speed pre-selected while cut is in progress.



#### SINGLE LEVER FEED SELECTORS

Controlled by single lever, direct reading, selectors. Feeds pre-selected while cut is in progress.



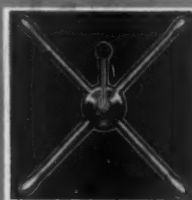
#### AUTOMATIC COOLANT SUPPLY TO HEXAGON TURRET

A copious supply of coolant is pumped automatically to the working face of the hexagon turret.



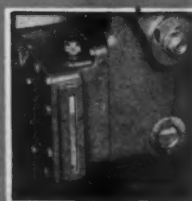
#### POWER TRAVERSE AND INDEXING OF THE HEXAGON TURRET

Turret of saddle type machines is power traversed and power indexed. A time saver and man saver too.



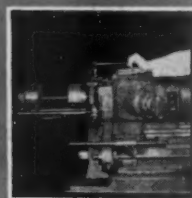
#### AUTOMATIC LUBRICATION SYSTEM

Requires minimum of attention. Flow of lubricant automatically increases as spindle speed increases.



#### SIMPLIFIED BAR FEED AND COLLET OPERATING MECHANISM

Operated by a single lever, which opens chuck, feeds in stock and closes chuck.



All these features and many others are incorporated as standard in Jones & Lamson Universal Turret Lathes.

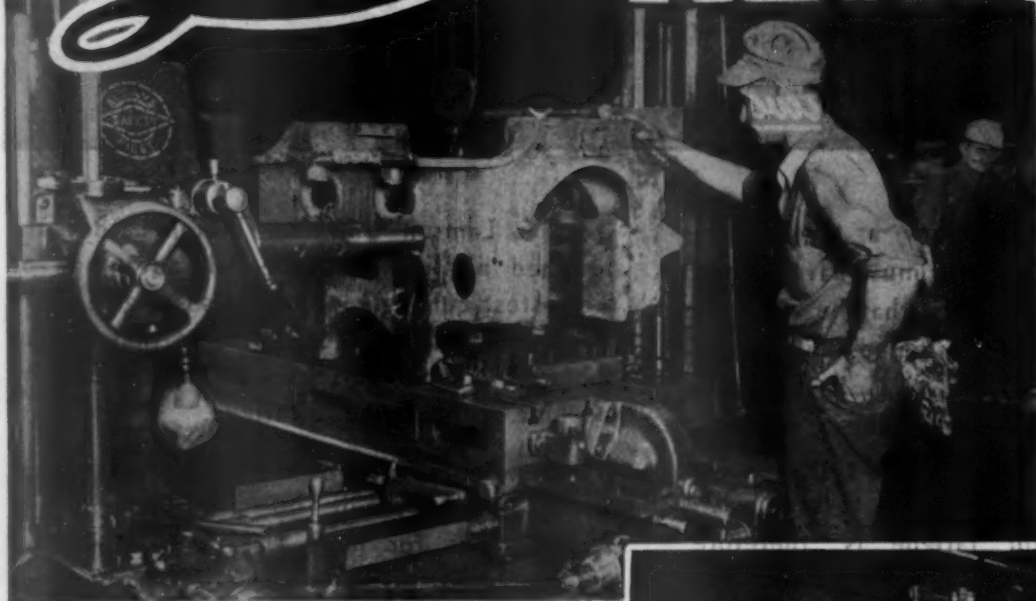
**JONES & LAMSON**  
MACHINE COMPANY  
Springfield, Vermont, U.S.A.



Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

# Lucas

## METHODS



Hinders for faster  
increased the prod  
and the burden  
necessity for simpli

**CUT COSTS ON  
DIFFICULT  
JOBS**



**T**HE wide range of jobs that can be completed in a single setting on a LUCAS Horizontal Boring, Drilling and Milling Machine gives this tool a unique place in modern railroad shops and locomotive builders' plants.

There are many heavy, awkward and clumsy jobs that are handled speedily and economically on a LUCAS, which if machined by other methods would cause the cost of locomotive repairs to mount to unreasonable figures.

Take for example the two jobs illustrated on this page; milling ports in a cylinder bushing and boring rocker seats on an engine truck frame—they are just two of the many jobs that make every railroad shop supervisor wish for a LUCAS "Precision" Multi-purpose Machine.

In addition to handling the difficult set-ups, the LUCAS is always ready to take on many other jobs, on the same production basis for which other special units are designed.

**LUCAS MACHINE TOOL CO.**  
CLEVELAND, OHIO



# FLAMENOL *Showed No Aging*



## IN THIS SIX-YEAR TEST UNDER FLORIDA'S SUN

Back in 1937, a large railroad company operating in the South, where climate is particularly unkind to cable insulations, decided to test the stamina of various types of insulation. Two of the samples tested were the usual rubber-insulated types; the third was Flamenol. None was protected by braid or other covering, so that insulation was exposed directly to sun and weather.

In 1943, after six years of continuous exposure, the three samples were taken down, and examined. The dramatically conclusive results are shown in the photographs above. Only Flamenol had stayed young!

### FLAMENOL RESISTS ACID, ALKALI, OIL, AND WATER

Before the war, millions of feet of Flamenol cable had already been installed in factories, oil refineries, mines and railroads; places where its ability to resist most solvents and heat made it a "must." In the future, this proved-performance cable will find even wider fields of application in reducing maintenance costs and minimizing shut-downs due to insulation failure.

Note, at the right, Flamenol's operating, installation, and maintenance advantages. For complete information, ask our local office, or write to General Electric Company, Schenectady 5, N. Y.

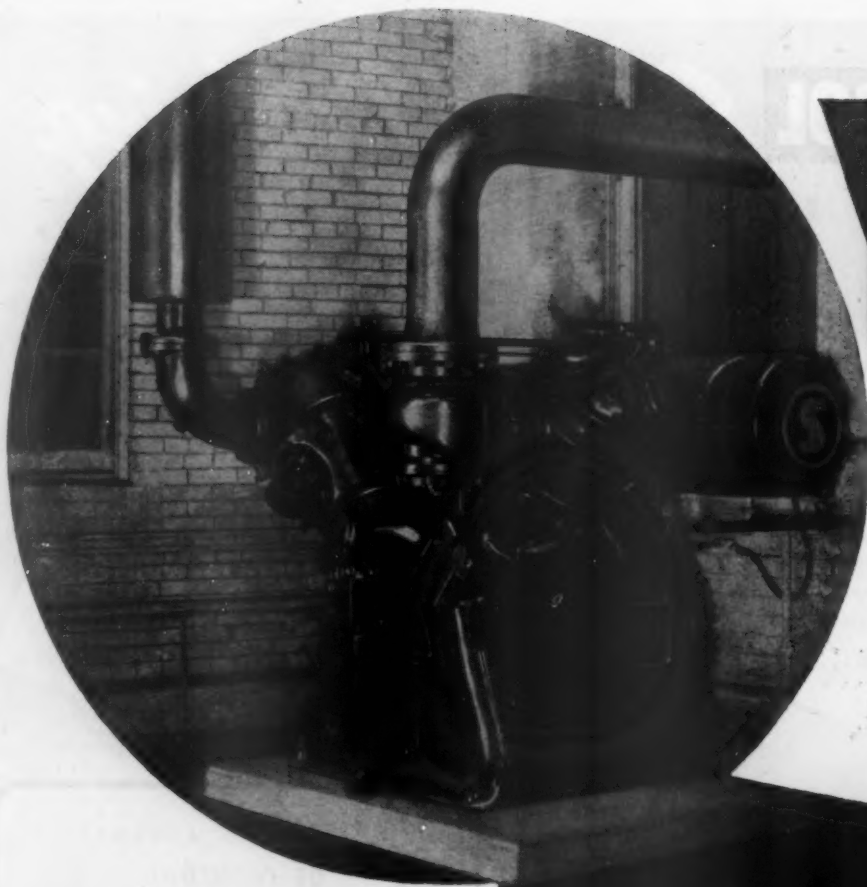
### 11 OUTSTANDING ADVANTAGES OF FLAMENOL

1. **FLAME RESISTANCE**—will not support combustion.
2. **CORROSION RESISTANCE**—immune to action of oils, acids and alkalis.
3. **SUPER-AGING**—will not oxidize, therefore highly resistant to sunlight and weathering.
4. **EXCELLENT PHYSICAL PROPERTIES**—minimum tensile strength, 1,500 lb per sq in.; minimum elongation, 100 per cent.
5. **CONSTANT DIELECTRIC STRENGTH**—retained at about 720 volts per mil under severe operating conditions.
6. **SMALL DIAMETER**—saves space, and speeds wiring.
7. **SMOOTH SURFACE**—facilitates pulling through conduit.
8. **VARIETY OF COLORS**—simplifies circuit tracing.
9. **FREE STRIPPING**—steps up installation, avoids weakening nicks on conductors.
10. **WIDE RANGE OF CONSTRUCTIONS**—aids selection for special applications.
11. **SELF-PROTECTING FINISH**—eliminates need for braid covering, saves space and weight.

Buy all the  
BONDS  
you can—  
and keep all  
you buy

**GENERAL ELECTRIC**





# YOU

*can have  
non-stop  
Compressor  
Service like  
this too!*

30 years of normal railroad repair shop service  
*crammed into 9...*

Here's a Sullivan Series 100 Compressor that went into service in the round-house of a well-known mid-west railroad in October, 1937, and has been running day and night, seven days a week continuously except for oil changes. This is equivalent to 30 years of normal 8-hour a day operation. Of even greater significance is the fact that total service wear repair parts costs were less than 1/100 of a cent per thousand cubic feet of compressed air delivered.

This is not an exceptional case of trouble-free performance, dependability, stability and low-cost operation but is typical of Sul-

livan Compressor service for other railroads, steel mills, mines, and industrial plants everywhere. Sullivan Series 100 Compressors are two-stage, double-acting, two and 4-cylinder types with capacities ranging from 378 to 3656 C.F.M. Choice of power, ease of installation, savings in time, space, materials and labor make them universal favorites for heavy duty, non-stop service. Let us show you how Sullivan Compressors can serve you too. Write to your nearest branch office.

Sullivan Machinery Company,  
Michigan City, Indiana. IN CANADA:  
Canadian Sullivan Machinery Co.,  
Ltd., Dundas, Ontario.

# SULLIVAN

**OFFICES**—Seattle • Boston • New York • Chicago • Portland • Pittsburgh • St. Louis  
• Detroit • San Francisco • Birmingham • Knoxville • Huntington • Los Angeles •  
• Duluth • El Paso • Butte • Salt Lake City • Scranton • Denver • Dallas.

**PRODUCTS**—Stationary and Portable Air Compressors from  
1/4 to 3000 H. P. • Pneumatic Casting Grips •  
Foundation Breakers • Portable Hoists • Rock Drills.



## 2 Reasons why

# RED LEAD

means Extra Rust Protection ...

Why is Red Lead so widely accepted throughout industry as *The* metal protective paint?

Why are paints containing Red Lead so generally specified for safeguarding metal surfaces from the costly ravages of rust?

The reasons are many, but none are more noteworthy than Red Lead's ability to counteract acid conditions and to halt electrochemical action—both prime causes of rusting—as explained at right.

Still another important advantage of Red Lead is that it partially combines with the usual vehicles to form compounds generally known as "lead soaps." Due to their composition and the individual way in which these compounds form, the film obtained is highly water-resistant. In addition, lead soaps contribute to the formation of tough, elastic films that "stick on the job."

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

### Specify Red Lead for ALL Metal Paints

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used.

## NEUTRALIZES



**1** Red Lead has the ability to counteract acid conditions which are recognized as accelerators of rust. Structural steel is exposed to such environments because acid forming compounds are carried by the atmosphere in the form of gas, smoke and moisture. Red Lead has a neutralizing effect on these conditions as it is essentially a basic pigment with the ability to develop and maintain, for a prolonged time, a mild alkaline environment at the surface of the metal. Authoritative tests show that, as a result, Red Lead inhibits the process of corrosion. In short, metal paints, too, should "stay on the alkaline side."



**2** Another outstanding reason Red Lead means extra rust protection is the unique way it shields metal surfaces with a protective film. Rusting is fundamentally an electrochemical process in which weak currents are generated which cause iron to become soluted in the lowest state of oxidation. Red Lead has properties through which this iron is rapidly converted to a stable compound that forms an adherent film. The formation of this protective shield halts electrochemical action, thus preventing further corrosion.

However its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better metal paint if it contains Red Lead.

### Write for New Booklet

"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior metal protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

The benefit of our extensive experience with metal paints for both underwater and atmospheric use is available through our technical staff.



**NATIONAL LEAD COMPANY:** New York 6, Buffalo 3, Chicago 10, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.)

## DUTCH BOY RED LEAD





**NEW HEAVY TOOLS  
GIVE MORE RIGIDITY  
AND GREATER RANGE TO**

## **CINCINNATI ACME TURRET LATHES**

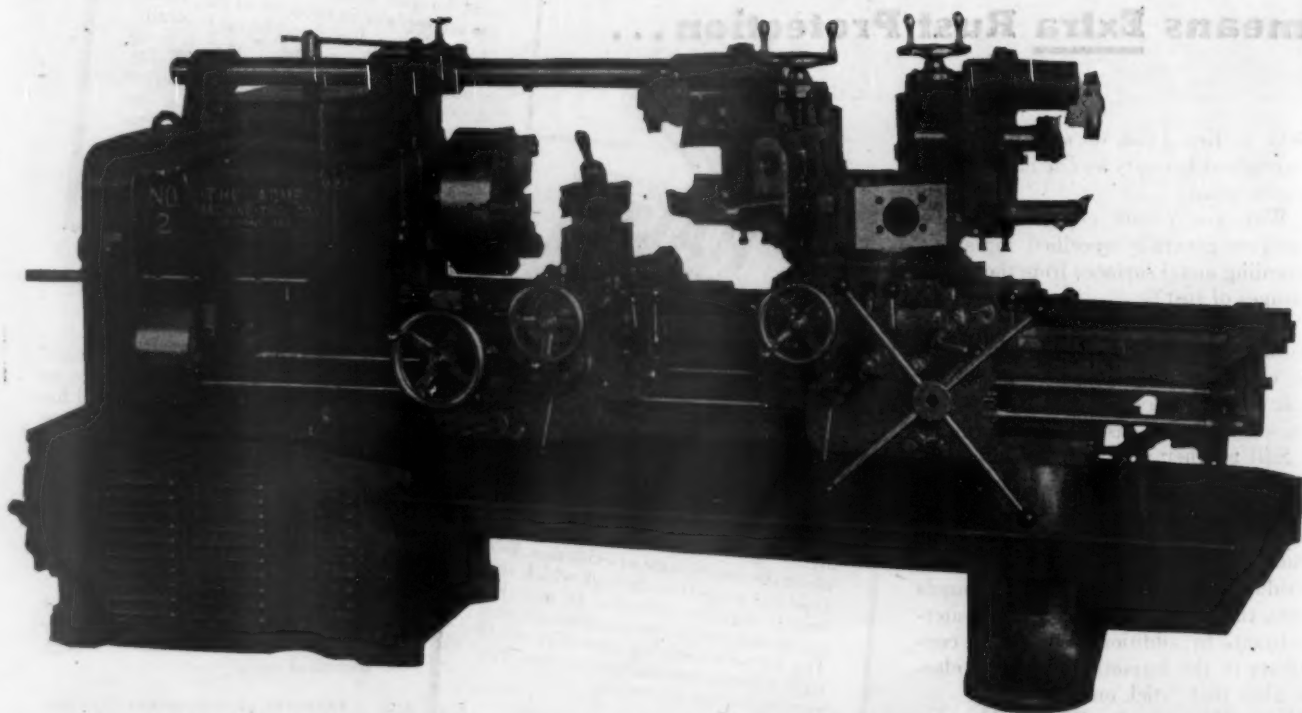
**F**ROM bed to tool post all Acme Turret Lathes are built to provide the power, speed and precision necessary for modern requirements.

Acme engineers have also made another important contribution to the progress that is being made with cemented carbide cutting tools — they have developed a **NEW LINE OF MASSIVE TOOL HEADS AND HOLDERS** which assure maximum rigidity and range of performance.

From left to right the above illustration shows an adjustable multiple turning head which takes its support on a rigid heavy stationary bar mounted on headstock — five heavy tool holders of the straight and angular types and a standard heavy duty multiple turning head with fixed center holes for holding the cutter heads.

In other words, every component on an Acme Turret Lathe is designed to withstand anything you wish to machine with modern cutting tools.

**OUR ENGINEERS ARE AT YOUR SERVICE**



*The* **ACME**

**MACHINE TOOL CO.  
... CINCINNATI, OHIO.**

Does one of  
these

## McKAY ELECTRODES

suit...

### STAINLESS STEEL

18-8 SERIES	18 Cr.
25-12	16 Cr.
25-12 Ch.	28 Cr.
25-20	5 Cr. Mo.
18-8 Mo.	TOOL & DIE
15-35	E-973
18-8 Ch.	FROGALLOY
12 Cr.	15-60

### MILD STEEL

21	116
3	14
15	16
11	16H
17	19
	F-22

OR DO YOU NEED THIS SPECIAL ONE?

### McKAY GIVES YOU THE RESEARCHED LINE

The McKay slogan, "every electrode a leader," is based on the determination to make every grade as good as painstaking research, careful manufacturing and unusually thorough step-by-step testing can make it. In addition to our own laboratories, an active fellowship in Mellon Institute fully qualifies McKay Electrodes to be called the *Researched Line*.

You will find in the *standard* line of McKay Electrodes an exceptionally wide range of mild steel, alloy steel and stainless steel rods of analyses suited to almost every welding need. From a range of 40-odd mild, alloy and stainless grades, you can normally select an electrode which will exactly fit your requirements.

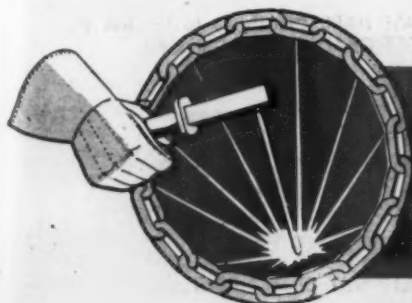
Occasionally, however, the need for a special electrode for a specific purpose will arise. In such cases, the facilities of our plant laboratory, working in collaboration with our Mellon Institute research department, will be placed at your service to develop the proper type of electrode for your particular job.

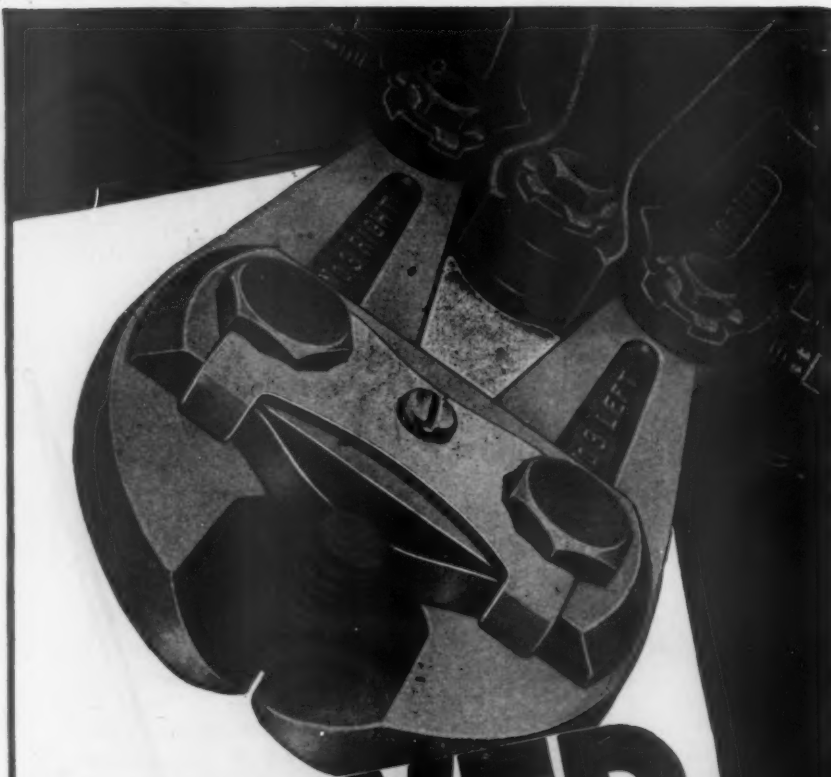
If available standard selections are not adequate, don't hesitate to ask for *this special* McKay service. Send full technical facts for our recommendations.

GENERAL SALES OFFICES: YORK, PA.

THE **McKAY** COMPANY  
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS





# POWER RODS, BOLTS, TO CUT BARS, CABLE, BY HAND WIRE, CHAIN

PORTER HKP CUTTERS work anywhere that two normally strong hands are available to put a few pounds pressure on the handles. Toggle-joint leverage will increase this pounds pressure to tons pressure on the jaws and even case-hardened chain can be cut "where is and as is". Standard models meet most production, construction, maintenance and emergency requirements.

The same power principle is applied to special tools for heading, pressing, crimping, punching and caulking with equal effectiveness. Send for our free booklet on tool maintenance to make clippers, saws, chisels, files and other tools do better work and last longer.

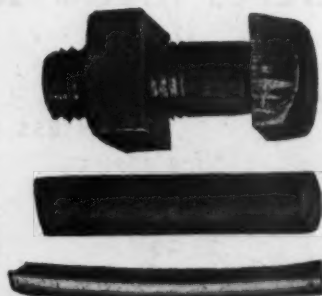
Have you a copy of our illustrated catalog?



H. K. PORTER, INC.  
430 Ashland St., Everett 49, Mass.

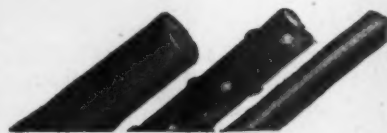
**PORTER HKP CUTTERS**

There are standard  
**PORTER CUTTERS**  
designed to cut



ANNEALED BOLTS up to  $\frac{3}{4}$ " in the thread.  
SOFT RODS up to  $\frac{5}{8}$ " diameter.

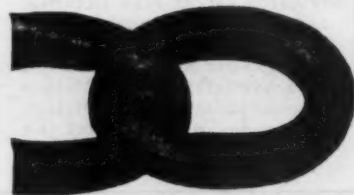
Non-ferrous metals, wrought iron, soft steel, cold-drawn screw stock, machinery steel, annealed tool steel and stainless iron.



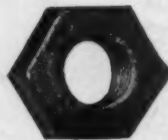
CONCRETE RODS up to  $\frac{1}{2}$ " diameter.  
SPRING WIRE up to 300 Brinell hardness.  
Unannealed tool steel, alloy steel bolts.



SOFT WIRE ROPE up to  $\frac{3}{4}$ "  
HARD WIRE ROPE up to  $\frac{5}{8}$ "  
SOFT BARS up to  $1\frac{1}{2}$ " x  $9/32$ "  
INSULATED CABLE up to  $\frac{5}{8}$ " solid copper wire.



CASE HARD CHAIN up to  $\frac{1}{2}$ " link dia.  
SOFT CHAIN up to  $\frac{5}{8}$ " link dia.



SPLIT NUT OF  $\frac{3}{4}$ " BOLT.

RAILWAY MECHANICAL ENGINEER





# 27 Spindle Speeds

*with only 2 control levers*

Convenience of control and ease of operation are two of the outstanding characteristics of the new "American" Pacemaker Lathe.

Imagine being able to secure any one of 27 spindle speeds thru only 2 conveniently placed direct reading levers without having to refer to index plates or having to retain lever positions in one's mind.

Operators are enthusiastic in their praise of this new speed control. It makes their work easier; they produce more work because of it and the pay roll dollar buys more as a consequence.

This and other fine features of the "American" Pacemaker are thoroughly covered by Bulletin No. 15.



**THE AMERICAN TOOL WORKS COMPANY**

LATHES AND RADIAL DRILLS

CINCINNATI, OHIO, U. S. A.

# This is a call to America's Heart



## Your Red Cross faces its greatest task

**T**HIS is the most important appeal for funds in the history of the American Red Cross.

After three years of war the work of your Red Cross is greater than ever. It must serve millions of our fighting men abroad. Lonely men. Homesick men. Wounded men. The Red Cross lends a helping hand to the thousands of returning service men—sick, wounded—desperately in need of friendly guidance.

And remember, **YOU . . . and you** alone . . . keep the Red Cross alive.

There are no special funds to keep up its great humanitarian work. The money must come, as always, from the heart of America—you!

We must keep the Red Cross at the side of our fighting men and our wounded heroes. We must help the Red

Cross in its vital job of sending food and medicine to war prisoners . . . aiding the ill and lonely overseas . . . collecting life-giving blood plasma. Every Red Cross worker is your personal messenger to your man in uniform.

**GIVE NOW—  
GIVE MORE**

*Keep your* **RED CROSS** *at his side*

## RAILWAY MECHANICAL ENGINEER

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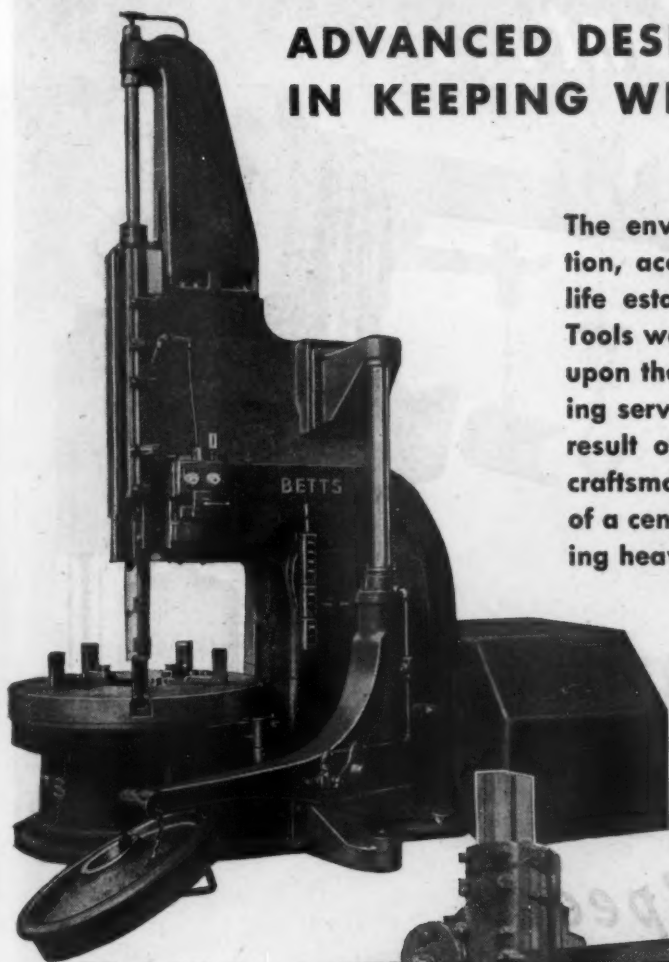
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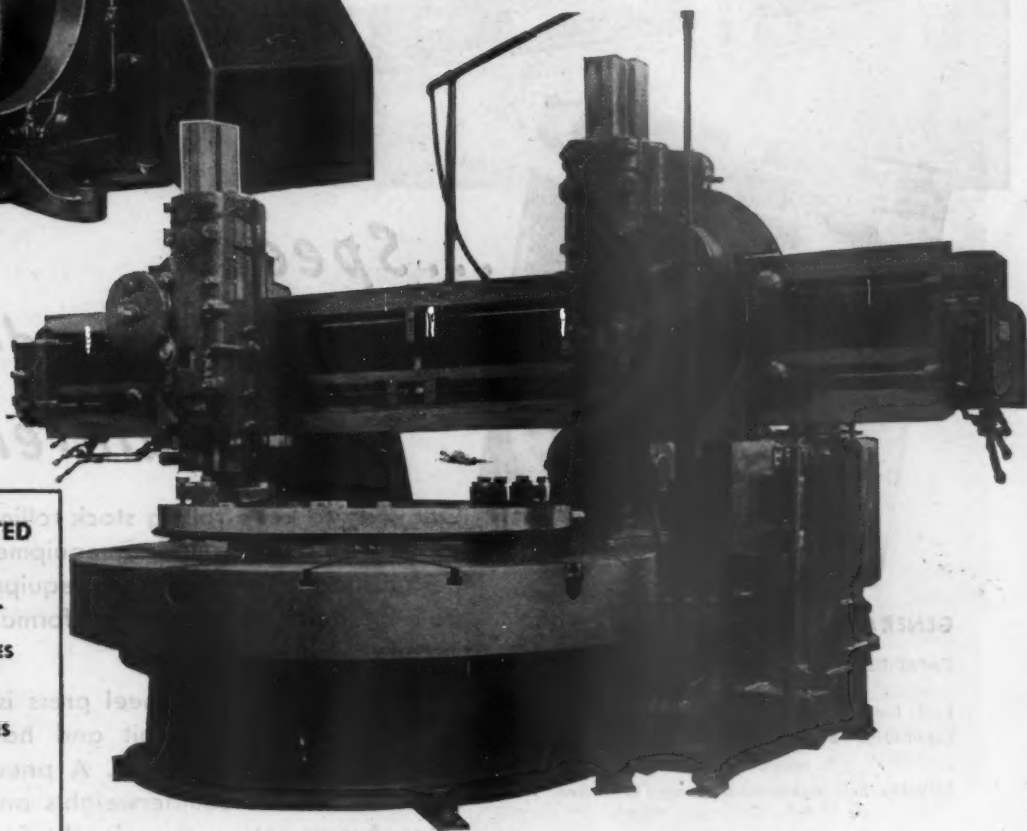
# CONSOLIDATED RAILROAD SHOP TOOLS

**ADVANCED DESIGN AND CONSTRUCTION  
IN KEEPING WITH RAILROAD PROGRESS**

The enviable reputation for stepped-up production, accurate performance, and long productive life established by Consolidated Railroad Shop Tools was not earned over night. It has been built upon their record of years of continuous, satisfying service in hundreds of railroad shops . . . the result of seasoned engineering skill and expert craftsmanship supported by nearly three quarters of a century of experience in designing and building heavy machine tools.



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HYDRAULIC FEED  
CAR WHEEL  
BORER**



**BETTS 112" HEAVY DUTY TIRE MILL**

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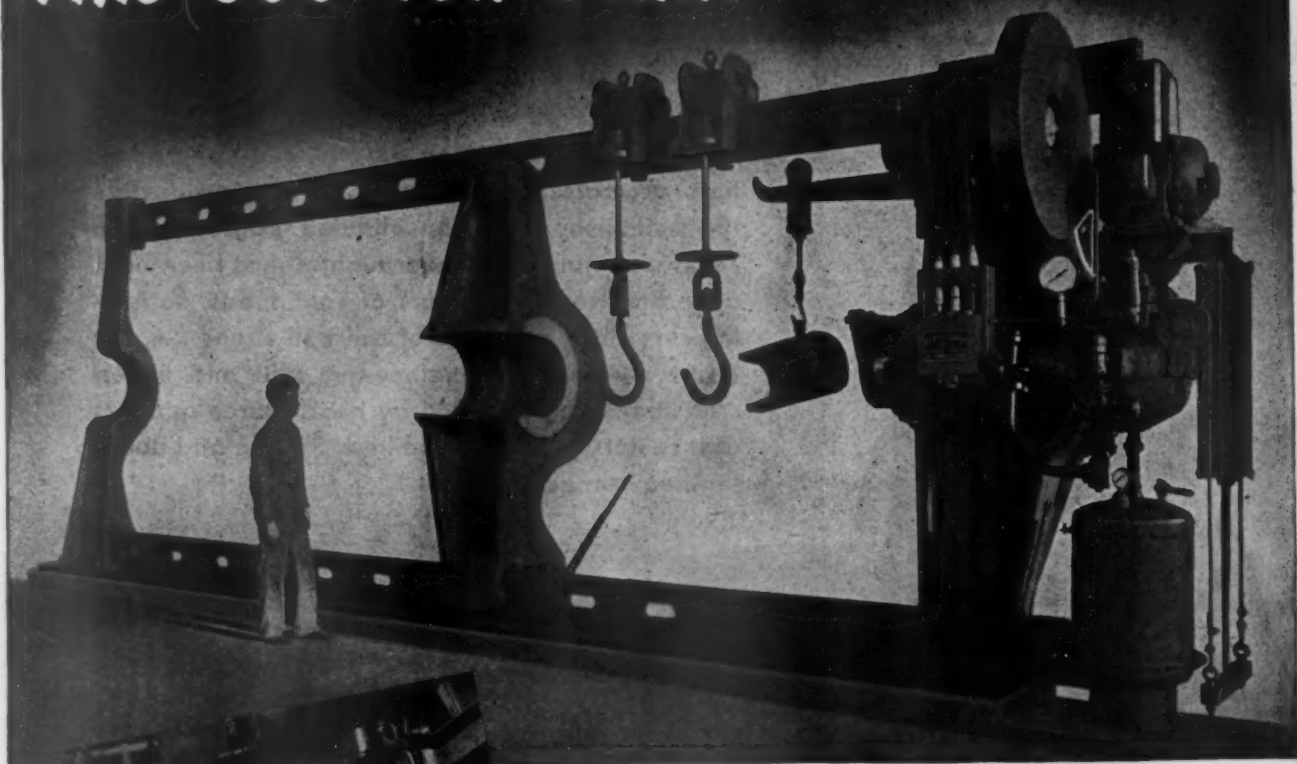
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MACHINE TOOL CORPORATION**

ROCHESTER 10, NEW YORK



# *This 600-ton Giant...*



## *...Speeds* **WHEEL-and-AXLE** *Maintenance!*

### GENERAL SPECIFICATIONS:

CAPACITIES: High pressure . . . 600 tons  
Low pressure . . . 100 "

RAM: Diameter 16", Stroke 26"

CLEARANCE: Between bars . . . 96"  
To resistance post . . . 20"

POWER: Self-contained pumping unit driven  
by 15 H.P., 1200 r.p.m. motor.

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One way to keep rolling stock rolling is to speed up repairs. This takes modern equipment. R. D. Wood design ingenuity in hydraulic equipment makes possible the quick, economical performance of vital work in railway shops.

This Wood hydraulic wheel press is an outstanding example. Requires no pit and has self-contained pumping unit and controls. A pneumatic pull-back device eliminates counterweights and gives a faster rate of ram return than is obtainable on ballast-weighted devices. It always pays to consult Wood engineers on hydraulic equipment requirements.



EST. 1803

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Write for  
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**MANUFACTURING COMPANY**  
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# LOCOMOTIVE PARTS FINISHED TO ADVANTAGE ON MATTISON SURFACE GRINDER

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## ADDITIONAL INFORMATION

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POWER REVERSE VALVE PART



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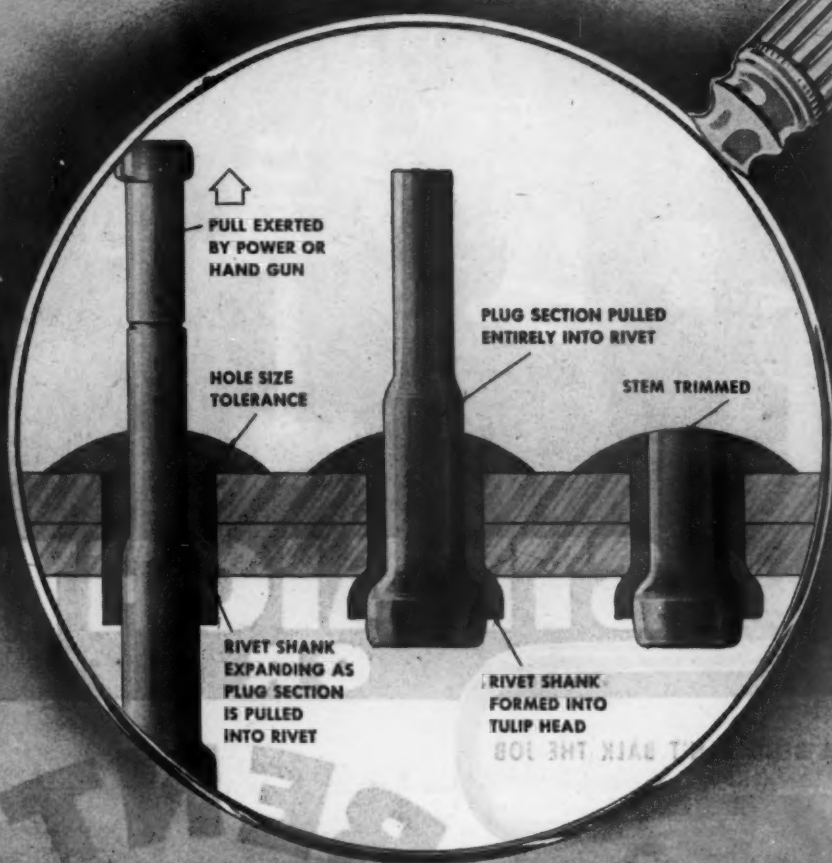
# MATTISON

## MACHINE WORKS

ROCKFORD · ILLINOIS



# It's SHANK EXPANSION..



*that makes* **CHERRY RIVETING** *so tight, so strong, so durable*

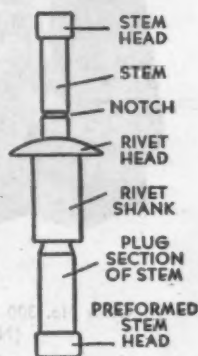
The high resistance to shear and fatigue typical of self-plugging Cherry Blind Rivets is due to positive mechanical expansion of the rivet shank.

This shank expansion occurs during application when the enlarged plug section of the stem is pulled into the rivet (drawings to right and above). The sides of the rivet are forced against the material being fastened, filling any irregularities in the drilled hole. The installed Cherry Rivet has shear and fatigue values comparable with those of a solid rivet—stays firm, even under excessive strain

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Oversize shanks on special order.



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Please send me your new booklet. Also enclose the metal demonstration panel which shows actual stages in installation of Cherry Rivets.

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**Cherry Rivet**  
*Company*  
LOS ANGELES, CALIFORNIA



# STRAIGHT OR



A BEND CAN'T BALK THE JOB

# BENT

## Oster No. 300 Series Pipe Threading Machines Handle ALL WORK

Oster No. 300 Series are built in three models (No. 326 illustrated).

No. 302: Standard range  $\frac{1}{4}$ " to 2" pipe. Bolt range  $\frac{3}{8}$ " to  $1\frac{1}{2}$ ".

No. 304: Standard range 1" to 4" pipe. Bolt range  $1\frac{1}{8}$ " to 2".

No. 326: Standard range  $1\frac{1}{4}$ " to 6". Bolt range  $1\frac{3}{4}$ " to 4".

[Extra pipe range and extra bolt range for each machine listed in catalog.]

Built on the revolving die-head principle and equipped with open type vise, these rugged machines need no complicated, expensive equipment to thread an exceptionally wide variety of work including long or short lengths of straight or bent pipe, and nipples, rods, studs, or bolts.

Full control of threading dies is obtained by the lever-operated die-head. Quick and easy adjustment of chasers for deep or shallow threads is another advantage. Calibrated thread length gauge enables operator to cut threads of standard length without looking into die-head. Many other features.

Full details about these versatile threading machines in illustrated catalog. Write for "LIST 12-A."



THE OSTER MANUFACTURING COMPANY, 2030 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

# What a beating these bearings take!

This is what you may not see when an armature—or any other high speed part—is snugly mounted on its bearings. But the forces caused by unbalance will cause vibration and will increase bearing loads. And the higher the R.P.M., the larger those forces.

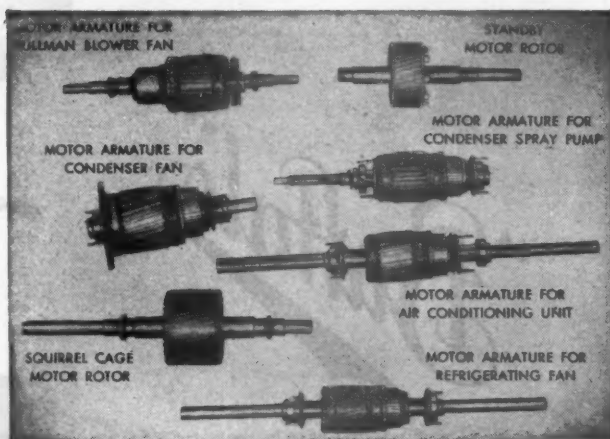
When generator or traction motor armatures are re-wound, they should be rebalanced. The irregular overlapping of windings, non-uniform deposits of lacquer, etc., create enough unbalance to cause vibration and to overload bearings, thereby inviting trouble.

**GISHOLT DYNETRIC BALANCING MACHINES\*** are used in railroad repair shops to good advantage to restore accurate balance and assure longer life in ventilating fans, lighting generators, and all kinds of rotating parts. Ask for full information about them.

\*A development of Westinghouse Research Laboratories.

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Group of Armatures and Motor Rotors Balanced on 3S Dynetric Balancer in the Electrical Shop of One of the Large Railroads.



**DYNETRIC BALANCING** is the quick and low-cost means of insuring better performance and longer life in many parts such as these in railway service. Locating and measuring unbalance corrections takes only a matter of seconds.

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# Instant, finger- tip speed-change

If you could operate an "RPMster" for a few minutes, you'd know exactly what we mean by instant speed change. At a touch of the lever mounted at the head of the drill your spindle speed is increased or decreased — instantly. Because there are no pulley steps for belt shifting the speed variations are very close together, so that changes thru the entire speed range are smooth. With this machine, using quick change chucks, several different types of operations can be made in the same set-up — each employing the PROPER SPEED. Spindle speeds may be changed while actually drilling.

Heavy duty construction of all parts assures long life. Speed and convenience of operation mean satisfactory usage. Price is lower than you might expect. Why not write today for Bulletin 3257 which gives details on single and multispindle models?

Write for Bulletin 3257

## BUFFALO FORGE COMPANY

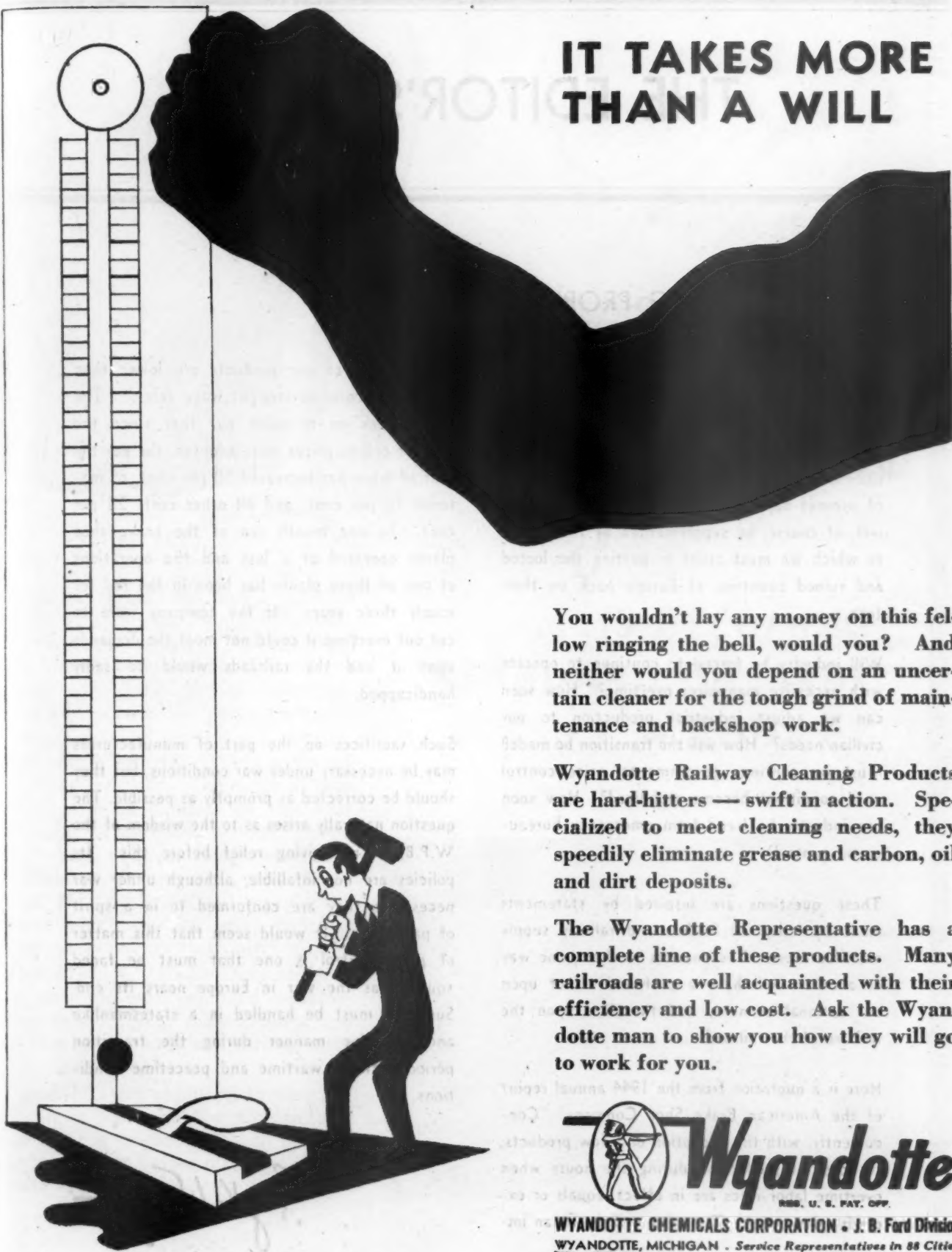
174 Mortimer St. Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



"the Drill with 100 Speeds"

## IT TAKES MORE THAN A WILL



You wouldn't lay any money on this fellow ringing the bell, would you? And neither would you depend on an uncertain cleaner for the tough grind of maintenance and backshop work.

Wyandotte Railway Cleaning Products are hard-hitters — swift in action. Specialized to meet cleaning needs, they speedily eliminate grease and carbon, oil and dirt deposits.

The Wyandotte Representative has a complete line of these products. Many railroads are well acquainted with their efficiency and low cost. Ask the Wyandotte man to show you how they will go to work for you.



# Wyandotte

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WYANDOTTE, MICHIGAN • Service Representatives in 88 Cities

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# THE EDITOR'S DESK

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## A CHALLENGING PROBLEM

The day is probably not far distant when Germany will break under the prolonged strain and war will come to an end in Europe. Whether the continuation of war in the Pacific will draw upon our resources to anywhere near the extent of present-day requirements, is a question; it will, of course, be supplemented by the extent to which we must assist in putting the looted and ruined countries of Europe back on their feet.

Will industry be forced to continue to operate with excessive manpower overtime? How soon can we adjust industrial production to our civilian needs? How will the transition be made? Must we continue governmental price control until conditions become stabilized? How soon can industry be freed from emergency bureaucratic control?

These questions are inspired by statements made by industrial leaders and railway supply manufacturers. The answers to them, one way or another, will have a profound effect upon our national economy and therefore upon the welfare of the railroads.

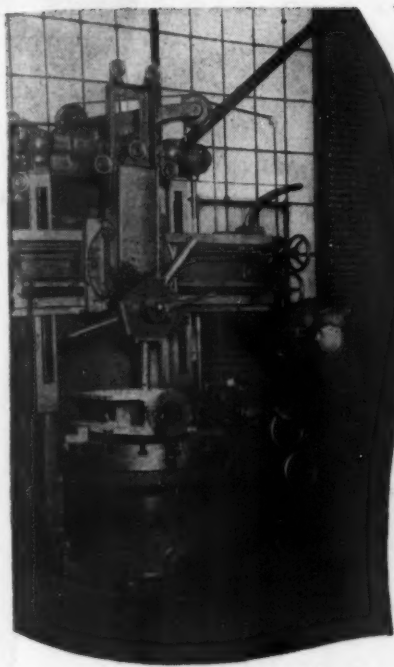
Here is a quotation from the 1944 annual report of the American Brake Shoe Company: "Concurrently, with the exception of a few products, the cost of production during the hours when overtime labor rates are in effect, equals or exceeds sales prices. The price ceilings on an im-

portant part of our products are lower than production costs at straight wage rates." The report goes on to point out that since the present ceiling prices were adopted, the per ton cost of labor has increased 50 per cent, of material 13 per cent, and all other costs 20 per cent. In one month ten of the brake shoe plants operated at a loss and the operations of one of these plants has been in the red for nearly three years. If the company were to cut out overtime it could not meet the demands upon it and the railroads would be sadly handicapped.

Such sacrifices on the part of manufacturers may be necessary under war conditions, but they should be corrected as promptly as possible. The question naturally arises as to the wisdom of the W.P.B. in not giving relief before this. Its policies are not infallible, although under war necessities they are conformed to in a spirit of patriotism. It would seem that this matter of price control is one that must be faced squarely as the war in Europe nears its end. Surely it must be handled in a statesmanlike and effective manner during the transition period between wartime and peacetime conditions.

*Roy V. Wright*





# The KING way

**T**HERE is not one single size or type of KING Boring Mills that is not recommended by railroad shop machine tool supervisors who are familiar with KING design, construction and production performance.

For all medium boring and turning jobs, the KING 42" Mill is endorsed by many railroads. The range of jobs which can be handled on this unit includes crossheads, pistons, piston bull rings, cylinder heads, valve and cylinder packing rings, valve bushings, throttle boxes and many other parts which can be easily chucked and machined on this unit.

This KING 42" Heavy Duty Mill can be obtained with any head combination to meet your requirements, one or two heads on rail and with or without side head.

The KING way of boring, turning and facing is becoming the standard way on many a railroad. It will pay you to investigate before making out your next requisitions.

**...IS BECOMING  
STANDARD ON MANY  
A RAILWAY**



## The KING MACHINE TOOL Company

**BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY**

**Cincinnati, Ohio**

## ANNUAL REPORT

To an Eastern Railroad System on Dearborn's Scientific Water Treatment Program for 1944.

It is gratifying to report that during the year, 4893 water samples from locomotives, stationary boilers, and the various water treating plants on your System were tested in the central laboratories, and in the field by 4 of our service engineers in the regular course of service calls.

### 4893 WATER TESTS

In addition to the saving of your own full-time water inspectors by virtue of the valuable services rendered by our corps of experienced engineers, supported by Dearborn's facilities and unexcelled chemical feeders, the 4893 tests, at the conservative commercial rate of \$1.25 per water titration, represent an . . .  
**extra and increased saving to you of \$5,116.25.**

# FIGURES TO CONSIDER...

**when operating costs assume importance again**

Annual reports by Dearborn to the railroads on services rendered during the preceding year always reflect the economies made possible by Dearborn Scientific Water Treatment Program.

Frequent check-up of water conditions at central water testing laboratories, coupled with necessary and supplementary control work in the field . . . in close co-operation with the railroads' own force . . . develop and effect substantial reductions in operating costs.

When these services are augmented by Dearborn water treatment materials, applied to wayside water supplies with Dearborn super-accurate chemical proportioners, the Dearborn water treatment program is rounded out into a complete cycle of scientific efficiency.

Dearborn water treatment and service will be an even more welcome means of locomotive efficiency, and annual reports which show a definite saving will be held in even higher regard when railroads

resume normal schedules and reins are again tightened on operating costs. Call the Dearborn Engineer in your territory or write to us direct.

#### DEARBORN CHEMICAL COMPANY

310 S. Michigan Ave., Chicago 4    807-15 Mateo St., Los Angeles  
205 E. 42nd St., New York    2454 Dundas St., West, Toronto



**Dearborn**  
TRADE MARK REGISTERED

**BOILER WATER  
TREATMENT  
AND SERVICE**

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(Name Registered, U. S. Patent Office)

With which is incorporated the RAILWAY ELECTRICAL ENGINEER.

Founded in 1832 as the American Rail-Road Journal

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APRIL, 1945

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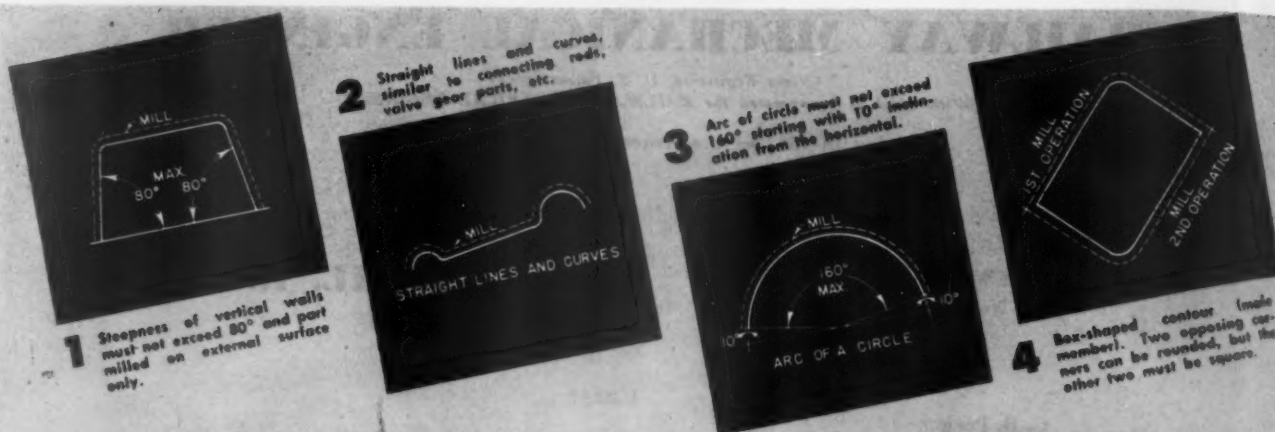
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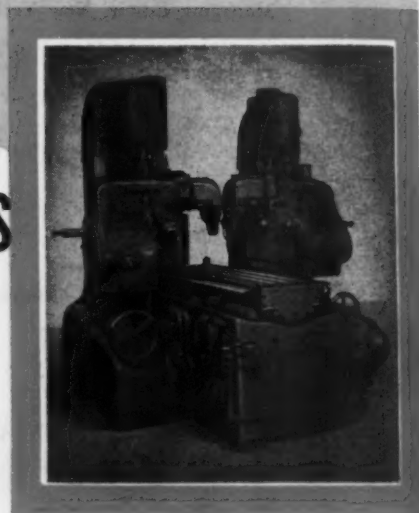


## milling uphill and down

### with **TRACER CONTROLLED HYDROMATICS**

Profiles or straight lines blending into curves always present a tough machining problem on conventional equipment. On a CINCINNATI Tracer Controlled Hydromatic, accurate profiles are milled automatically, duplicating the outline of a template. And the table feed is automatically varied, assuring maximum efficiency of metal removal...eliminating any possibility of cutter breakage.

The four drawings shown here indicate the range of profile shapes which may be milled on these efficient machines. How many profile milling jobs in your shop fall within these classifications? You probably will find many of them, such as the channeling of connecting rods. Our engineers will be glad to recommend the proper equipment and method.



Illustrated above is the CINCINNATI Tracer Controlled Hydromatic Milling Machine (Duplex model). Both the Plain and Duplex models are available in 12 sizes, with table travels up to 90". Catalog M-1295 gives complete information and specifications. Sweet's Catalog File for Mechanical Industries contains a brief description of these machines.



No. 45-48 Duplex Tracer Controlled Hydromatic, milling the bevels on cylinder head retainers for Diesel engines. The operation is handled progressively, by transferring the part from one side of the fixture to the other.

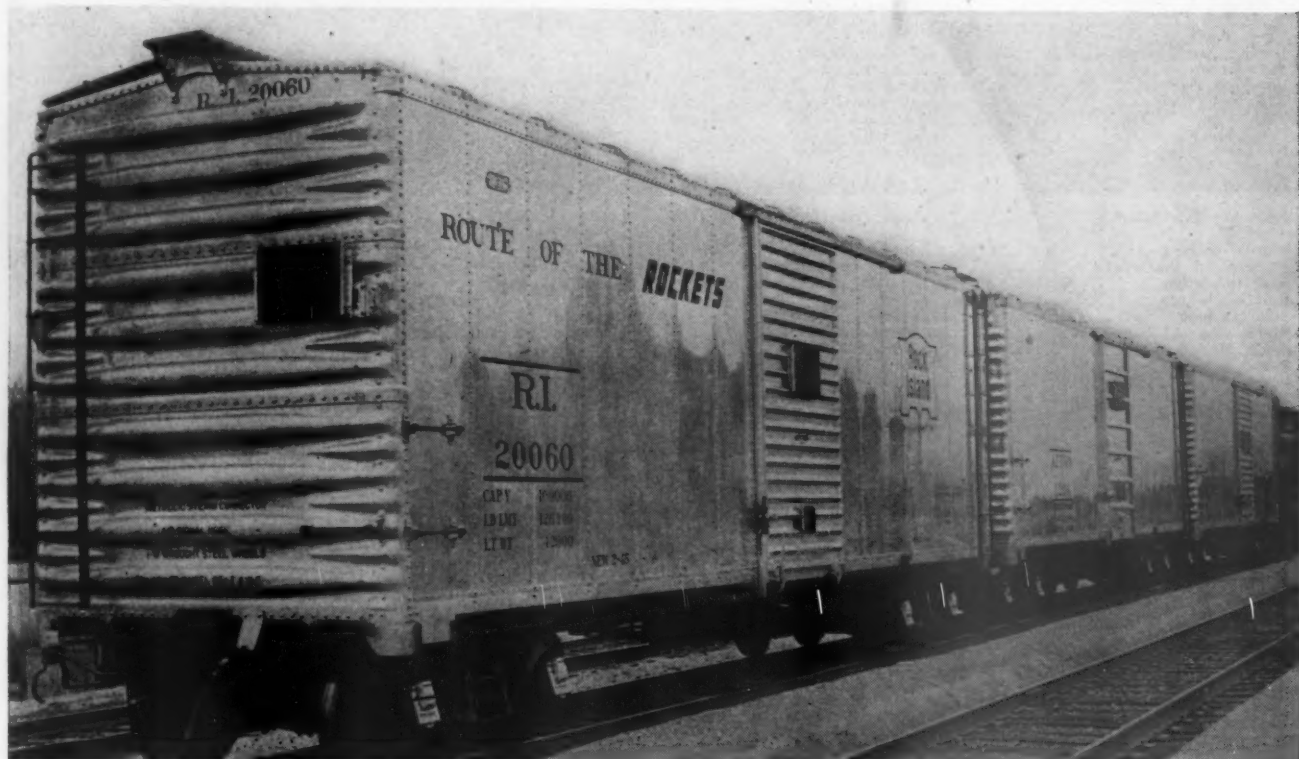


**THE CINCINNATI MILLING MACHINE CO. CINCINNATI, 9 OHIO, U.S.A.**

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING MACHINES

Three Roads Buy

# Aluminum Alloy Box Cars



**T**HE first three box cars, designed especially for the use of strong, aluminum alloys for side frames, as well as exterior sheathing, ends, roof, doors and all other parts of the superstructure, were turned out by the Mt. Vernon Car Manufacturing Company, Mt. Vernon, Ill., during the latter part of February. These cars, built primarily of Reynolds aluminum alloy R-301 and designed by engineers of the Reynolds Metals Company, Chicago, comprise part of an order for 30 cars, or 10 cars each for the Alton, the Rock Island and the M. & St. L., delivered and placed in service on these three roads during March.

This car design has been developed in conjunction with the Car Construction Committee of the A.A.R. Mechanical Division and permission granted to build 50 cars for use in general interchange service. As a matter of fact, the Rock Island cars with steam and air signal lines, special brake equipment, swing-motion trucks and roller bearings on five cars, are being used for head-end service in high-speed passenger trains. The Alton cars, also having special equipment, and friction-bolster trucks,

**First of 30 cars designed by Reynolds engineers and built by Mt. Vernon are delivered to the Alton, C.R.I. & P. and M. & St. L.**

are designed for head-end service in local passenger service. The M. & St. L. cars are intended for freight service only and for the present, at least, are more or less confined to service on the owning road so that their performance may be better studied.

The story of the new Reynolds 50-ton aluminum box car is told in the four accompanying tables. The primary objective in developing this particular type of car was not to achieve maximum weight reduction but to produce a lightweight design of exceptional strength and durability, high corrosion resistance, low center of grav-

## Partial List of Materials and Equipment on 30 Reynolds Aluminum Box Cars Built for Three Railroads by the Mt. Vernon Car Manufacturing Company

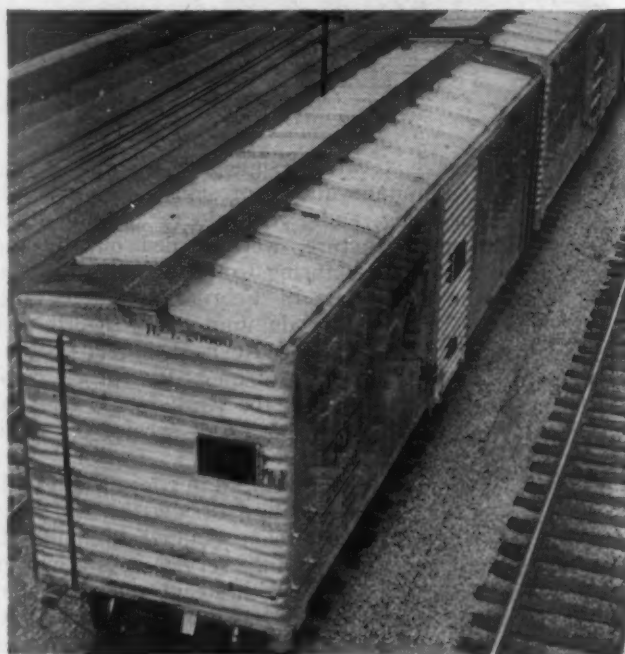
	Alton (10 cars)	Rock Island (10 cars)	M. & St. L. (10 cars)
Air brakes	Westinghouse AB1B	Westinghouse AB1B	New York AB
Air brake pipe	Byers extra heavy w.i.	Steel	Extra heavy steel
Axles	Pittsburgh, hollow	Carnegie-Illinois	Pittsburgh, hollow
Body brake levers	Schaefer	Car builder	Car builder
Bolsters and side frames	Cardwell (2 cars) Buckeye (8 cars)	Buckeye	Buckeye
Bottom rods	Schaefer	Schaefer	Pittsburgh Steel*
Brake beams	Creco No. 15	Creco No. 15	Schaefer
Brake beam hangers	Schaefer	Schaefer	Creco No. 15
Brake beam supports	Creco 3-point	Creco 4-point	Grip Nut
Brake hd. wear plates	Illinois Ry. Equip.	Schaefer	Illinois Ry. Equip.
Brake pipe clamps	Illinois Ry. Equip.	Car builder	T-Z Ry. Equip.
Brake shoes and keys	Am. Brake Shoe	Am. Brake Shoe	Am. Brake Shoe
Brake steps	Apex	Apex	Apex
Branch pipe anchor	Illinois Ry. Equip.	Car builder	T-Z Ry. Equip.
Cotters	Gustin-Bacon	Common	Central Ry. Equip.
Couplers	National Malleable	Buckeye	National Malleable
Coupler cush. device	Standard Ry. Equip	Standard Ry. Equip	Standard Ry. Equip
Coupler yokes	Buckeye	Buckeye	Buckeye
Defect card holders	Apex R 4 A	Apex R 4 A	Apex R 4 A
Doors	Superior (5 cars) Camel (5 cars)	Camel	Camel
Draft gear	Cardwell West.	Miner (5 cars)	Miner A-22-XB
Draft key ret. lock	Illinois Ry. Equip.	Card. West. (5 cars)	Illinois Ry. Equip.
Dust guards	Ajax	None	Laminated wood
Ends and roofs	Standard Ry. Equip.	Plywood (5 cars)	Standard Ry. Equip.
Floor bolts and nuts	MacLean-Fogg	Standard Ry. Equip.	MacLean-Fogg
Floor clips	MacLean-Fogg	Grip Nut	MacLean-Fogg
Hand brake	Ajax	MacLean-Fogg	Superior
Journal bearings	Magnus, Satco	Equipco	Magnus, Satco
Journal boxes	Cast in side frames	Magnus, Satco (5 cars)	Cast in side frames
Jour. box lids (alum.)	Motor Wheel	Timken (5 cars)	T-Z
Journal packing	Spring Pkg. Co.	Fort Pitt (5 cars)	Spring Pkg. Co.
Plackard bd. brackets	Trans. Specialties	Timken (5 cars)	Trans. Specialties
Roof insulation	Dednox	Alco (5 cars)	Plywood
Running boards	Apex	Timken (5 cars)	Apex
Side bearings	Stucki	Spring Pkg. Co. (5 cars)	Stucki
Signal pipe	Byers standard w.i.	Trans. Specialties	Crane steel
Slack adjusters	Royal K-2	Insulmat	
Snubbers	Card. West. (8 cars)	Apex	
Springs	Card. West. (6 cars) Am. Loco. Co. (4 cars) Card. West. (2 cars) Am. Loco. Co. (8 cars)	Stucki	Am. Loco. Co.
Spring plates	Byers ex. heavy w.i.	Extra heavy steel	T-Z
Steam line	Schaefer	None required	None
Truck brake levers	Cardwell (2 cars)	Extra heavy steel	Schaefer
Trucks	Double truss (8 cars) Card. West. (2 cars)	Schaefer	Barber S-2
Truck stabilizer	Card. West. (2 cars)	Barber S-4-L	Barber S-2
Waste retainers	Spring Pkg. Co.	Spring Pkg. Co. (5 cars)	Spring Pkg. Co.
Wheels one-wear steel	Carnegie-Illinois	Carnegie-Illinois	Carnegie-Illinois
Pipe insulation	Union Asbestos	Union Asbestos	None
Steam end valves	Vapor		

\* Side frames on 10 cars.

ity, increased potential load capacity and one which could not only be built new but repaired and maintained with tools and equipment already available in car builders' and railway shops. Service experience with the 30 cars now under construction is expected to prove the availability and adaptability of aluminum as a structural material for box cars in a design especially developed to meet the exacting requirements of railway service.

### Construction of the Aluminum Car

In order to meet A.A.R. strength requirements and the present preference of a great majority of railway mechanical officers, the underframe of the Reynolds car comprises welded steel construction with a carbon steel center sill, alloy steel bolsters and cross bearers, steel center plates, draft lugs, etc. The longitudinal floor supports, however, are made of aluminum, also the side sills, side plates and all other parts of the car superstructure, except the door track and fixtures and the safety appliances which are of steel. A little less than one-half of the car-body weight is steel and about one-third aluminum, the balance being lumber, car cement, paint, etc. Due to the all-aluminum superstructure, the center of gravity is unusually low, in the Rock Island car, for instance, only 48 in. above the rail when empty. The center of gravity is somewhat higher for those with lighter trucks.



The aluminum car from the top





The floor stringers in the underframe, the side posts and ends are aluminum

An example of the way in which car strength has been secured at some sacrifice in weight saving is afforded by the side and end construction. Twenty-four side posts are provided in the design, as compared with 16 in conventional steel cars. All posts are large extruded sections which keep outward deflection of the car sides under full load within desired minimum limits, thus assuring, among other things, easy-operating side doors. The side posts, in conjunction with  $\frac{1}{8}$ -in. side sheets, are firmly riveted in place and constitute, in effect, deep girders which keep the deflection of the car at the center under heavy loads within conventional limits. Stresses are carried across the door openings by continuous side plates of large cross section at the top and bulb angle re-inforcement to the side sills at the bottom.

The car ends, of three-piece riveted construction, with

extruded aluminum W-corner posts, are designed with ample strength to hold lading against any ordinary road service or switching shocks, the bottom, intermediate and top sheet thicknesses being  $\frac{5}{16}$  in.,  $\frac{1}{4}$  in., and  $\frac{3}{16}$  in., respectively.

Aluminum rivets used in the car construction are driven cold up to  $\frac{5}{8}$  in. in diameter with pressure riveting machines wherever possible. Where pneumatic hand

#### General Dimensions of Reynolds Aluminum 50-Ton Box Car

Length over pulling face couplers, ft.-in.	44- 4
Length inside, ft.-in.	40- 6
Length truck centers, ft.-in.	30-10
Width overall (door fixtures), ft.-in.	10- 7 $\frac{3}{4}$
Width over frame, ft.-in.	9- 9 $\frac{3}{4}$
Width inside, ft.-in.	9- 2
Height from rail to top running board, ft.-in.	14-11 $\frac{3}{4}$
Height from rail to floor, ft.-in.	3- 7 $\frac{3}{4}$
Height inside, ft.-in.	10- 6
Clear height door opening, ft.-in.	9-10 $\frac{11}{16}$
Clear width door opening, ft.-in.	6- 0
Cubic capacity, cu. ft.	3,900
Load capacity, lb.	100,000

#### Material Used in Reynolds Aluminum Box Car Bodies

##### Aluminum Parts

Side sheets	Draft gear carriers
End sheets	Floor bolts
Roof sheets	Floor clips
Roof carlines	Nailing piece bolts
Door sheets	Rivets in superstructure
Door trimmings	Hand brake housing
Running board	Journal box lids
Brake step	Defect card holders
Intermediate post	Routing board brackets
Door posts	Placard board brackets
Corner posts	Spring packing springs
Side sills	Journal-box packing retainers
Side plates	Brake badge plate
Floor supports	Builder's badge plate
Diagonal braces	Marker lamp brackets
Follower plates	

##### Steel Parts

Center sills (carbon)
Bolster and crossbearers (alloy)
Bolster center fillers
Striking castings and draft lugs
Couplers and draft gears
Crossties (alloy)
Center plates
Bulb angles at doorways
Door track and fixtures
Air brake equipment
Safety appliances

31 aluminum parts weigh 7,017 lb.,\* or 28.8 per cent of car body weight.  
11 steel parts weigh 10,823 lb.,\* or 44.5 per cent of car body weight.  
Other materials, including lumber, insulation, car cement, paint, etc., weigh 6,500 lb.,\* or 26.7 per cent of car body weight.

\* Rock Island car—Weight would be slightly different for the other cars.

hammers have to be used the rivets are driven hot. All floor bolts and clips, lining-strip bolts, stud-rivet bolts and nuts are aluminum. One interesting advantage of the use of aluminum floor bolts to hold the tongue-and-groove flooring is that the car may be loaded with explosives without covering the bolt heads, as ordinarily required by I.C.C. Bureau of Safety regulations.

The journal-box lids, made of aluminum, also constitute a safety feature, as they reflect light from automobile headlights at night and indicate the presence of cars on highway crossings. Spring packing, with aluminum springs, is kept in place by Holdrite packing retainers, made of aluminum spring material, R-303-T 315. The new type of coupler-centering device which is installed gives spring support to the coupler in both vertical and lateral movement, an especially desirable feature for the cars when used in passenger train service.

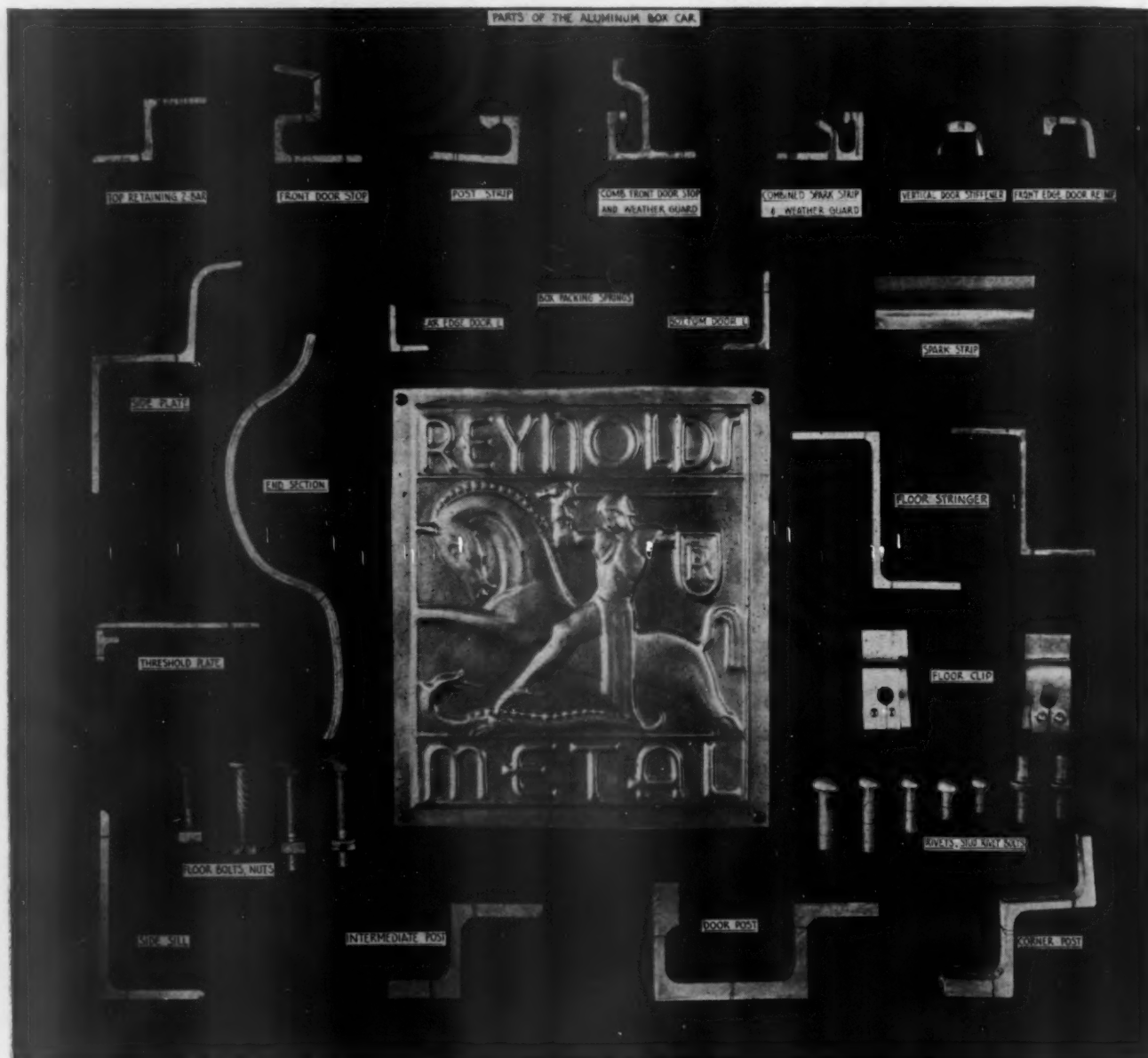
#### Painting

Steel underframes of the car are painted with regular primer paint and one coat of car cement is applied. Aluminum parts of the underframe are painted with a

# Detail Weights of Reynolds Aluminum Box Cars Built by Mt. Vernon for Three Railroads

	Alton* (lb.)	Rock Island† (lb.)	M. & St. L.‡ (lb.)
Underframe, primarily welded steel except floor supports	10,600	10,600	10,200
Side sheets, side sills and all posts, made of aluminum	3,995	3,998	3,996
Ends, 3-piece aluminum	1,028	1,028	1,028
Roof, complete aluminum	833	833	833
Doors, aluminum except for steel track and fixtures	652	738	738
Running boards and brake steps, made of aluminum	186	186	186
Safety appliances, steel	377	377	377
Hand brakes, aluminum	69	80	72
Lumber, insulation, car cement and paint (1)	6,500	6,500	6,570
Weight of all aluminum parts (2)	6,969	7,017	7,015
Weight of all steel parts (3)	10,771	10,823	10,415
Total car body weight, (1)+(2)+(3)	24,240	24,340	24,000
Weight of trucks	13,760	18,560	13,000
Light weight of car	38,000	42,900	37,000

\* These cars have AB1B brakes, steam and signal lines, Cardwell stabilized double-truss spring-plank trucks, hollow axles and one-wear steel wheels.  
† These cars have AB1B brakes, steam and signal lines, Barber stabilized swing-motion trucks, solid axles, one-wear steel wheels and roller bearings (5 cars).  
‡ These cars have AB brakes, hollow axles, Barber stabilized spring-plankless trucks S-2 and one-wear steel wheels.



Aluminum parts of the Reynolds box car

zinc chromate primer and one coat of car cement is applied. The inside surfaces of the superstructure from the side sill to 15 in. in height are painted with a zinc chromate primer. All aluminum surfaces in contact are painted with zinc chromate primer, as a sealer. The contact surfaces between aluminum and steel are painted

with zinc chromate primer on the aluminum and an ordinary primer coat on the steel surface. Roof joints are sealed with Alumilastic and all other joints caulked with the same material. No paint is used on the car exterior except stenciling which is applied after a light etching of the surface beneath the letters and numbers.

# Responsibilities of Foremen

THE following papers were prepared for the year book of the Master Boiler Makers' Association by members of its Advisory Board. A note of commendation on the safety record being achieved in the boiler departments from H. H. Urbach, mechanical assistant to vice-president, Burlington, has been omitted. The others are abstracted.—EDITOR.

## A Wide Range of Interests

By E. R. BATTLE

*Chief of motive power and car equipment, Canadian Pacific*

It is generally known and freely admitted that the railways have during the war years undertaken and performed a remarkable job. One of the contributing factors is their ability to keep locomotives on hand in constant service. To the rendering of such service the boiler inspector and his staff contribute a great deal.

The Interstate Commerce Commission in the United States, and the Board of Transport Commissioners in Canada, recognized the importance of the status attaching to a boiler inspector when they formulated Section 6 (similar law in Canada) of the Locomotive Inspection Law.

In framing this law our governments have set an exceedingly high standard for the men whose duty and responsibility it is to protect the railroads from failures due to the improper design, maintenance or handling of boilers. To carry out the requirements set down by law necessitates the services of a specialist, one who has specialized knowledge of boilers, appurtenances and pressure vessels, and who can apply himself and solve the many and intricate problems attached to the proper, economical and safe operation of every type of boiler. This is briefly indicated by the following resume of duties and responsibilities.

The duties of a boiler inspector are to acquire an understanding of the general principles of boiler design, construction, stresses, appliances and materials; to educate himself sufficiently to have a working knowledge of mathematics, drawings and blueprints; to be familiar with and follow the latest methods of making repairs; to study the principles of autogenous welding, composition and amalgamation of metals; to become conversant with the various boiler water treatments and the methods of treating boiler feedwater; to become thoroughly versed in all requirements of inspection laws and company regulations affecting locomotive and stationary boilers, fire appliances and pressure vessels; and to acquire an attitude which enables him to meet and handle all classes of men.

The responsibilities of a boiler inspector are to see that the requirements of all inspection laws and maintenance regulations of the railway in connection with this branch of the service are carried out; to know that all defects disclosed by examination are properly repaired; to know that all inspection forms are made out correctly, showing conditions as they exist; to discourage inferior workmanship and endeavor to create a desire on the part of all employees to take pride in their work; to educate

local boiler foremen to compile boiler reports carefully for engines about to be shopped; to know that boilers are being washed out properly; that no accumulation of scale or mud is allowed to form in any part of boilers and to see that proper tools and water pressures are used in the operation; to report to superiors any condition that appears of an unusual character and might lead to future trouble; to be constantly on the lookout for young men of promise who are capable of and willing to take on additional responsibility, and to recommend such men to higher officers so that they might be considered for promotion; and to maintain high standards in keeping with the teachings of the Boiler Makers' Association.

## Selecting and Training Supervisors

By F. K. MITCHELL

*Assistant general superintendent motive power and rolling stock, New York Central*

In building for a future which will be insured of good, capable and efficient boiler supervision, no more important problem than the selection of the supervisor will present itself.

The care with which this task is done will be the measure of future success; the difference between good and unsatisfactory production, between a smoothly functioning organization and unwilling compliance with orders, between harmony and continual labor troubles, between good workmanship and poor workmanship, and finally, between economic and costly operation.

In shopping for the boiler supervisor, as in the case of any shopping for any article you might need, the proper fundamentals behind the task are: first, to know what you want, and second, to start early enough so that when the supervisor is needed you will already have located him. This task requires you to know what kind of man you want; how many supervisors you are likely to need and when you are likely to need them; where you are most likely to find them; how to train them for their jobs, and how to interest them in accepting the job. Taking these requirements in their order let us see how the job should be done.

The supervisor should have a good personality, that is to say, he should have that unexplainable something which makes men like and respect him and makes him like and respect the rights of other men. Next, he should have the natural mechanical ability so that he may readily progress with his job. Then he should have a reasonably good education so that he can understand instructions, clearly convey his instructions to his men, and keep properly all necessary records. Finally, he should have a background of good varied mechanical experience, including design, layout, construction and repair of locomotive boilers and other equipment which is the boiler department's responsibility.

There is another phase of the shopping problem that is often overlooked. Too many candidates for supervisory jobs may result in some of them becoming spoiled and to have too few is just as bad for the organization. The



first and most necessary requisite here is to know your organization. Not only does this mean to know the supervisors, but as far as is humanly possible, every man in the organization from the latest employed laborer to the top ranking supervisor. Only by so doing can you know how many supervisors you should have and how many vacancies for supervisors you are likely to have to fill in any given period. You must know what supervision is necessary to get the best results from your organization, and you must know the capabilities, shortcomings, physical condition, age, attitude and even the home life of your existing supervisors. You must know the mortality rate, retirement dates, the possible loss to other departments and other industries from your supervisory ranks. Such intimate knowledge will serve to answer both the question of how many supervisors you are going to need and about when you will need them.

You are not going to find full-fledged supervisors. What you must look for and find are the candidates for those positions who possess certain fundamental qualifications, some of which are inherent and others of which are susceptible to development. A few such candidates will be found among your existing employees. The balance will have to be inducted into the ranks of your employees through the apprentice systems.

The best candidate is one who has been trained so that his background of experience will eventually fit him for any supervisor's position in the boiler department. Mechanically that means he must be a boilermaker in the true sense of the word. The scope rule in the majority of labor agreements spells out the things which he must be qualified to do and do well. Part of this you must see that he learns during his apprenticeship. The balance, which is even greater, you must give him after he becomes a journeyman. Whenever possible this experience should include not only shop but also engine terminal work.

While he is receiving this mechanical training you must follow him closely and study him intently in order to be sure that he has those other essential supervisory qualities which you suspected he had when he started his apprenticeship. If you find that you were wrong and that he does not possess them in the necessary degree, the fairest thing to him and to your company is to cross him from your potential supervisors' list at once and make the best mechanic out of him that you can. If your close observance of him verifies the fact that he possesses those qualifications to a satisfactory degree, start at once to develop him into a supervisor. Diamonds are not mined without sweat, and after being mined are not in shape for the market without painstaking care, cutting and polishing. No more can you expect to produce a good supervisor without similar care, shaping and polishing. Infinite care in polishing and improving his better qualities, and in eliminating or minimizing his objectionable ones will, in the end, pay dividends in the satisfaction of producing a supervisor who will fulfill completely the assignments he will later undertake. To that end, no amount of counsel, admonition, advice and example in laying out and assignment of work, planning of work to fit production schedules, diplomatic handling of men, learning and administering labor agreements and methods of insuring confidence in others, can be amiss.

In recent years there has been a growing tendency on the part of men to reject positions as supervisors when they are offered. Have you given any study to the reason for this? Here are a few which may throw some light on the answer to the problem we are considering:

1—Are we offering these positions to men who have not been trained for them and who realize that fact?

2—Are we exhibiting a tendency to place qualified

men on supervisory jobs and then not giving them our advice and counsel on how to handle them?

3—Have they noticed that others thus placed have not been given a break and if they have appeared to be faltering merely demoted or discharged without due consideration?

4—Have we shown by past example that our supervisors have been subjected to abuse when things are not going right?

5—Have we failed to make them a part of management and as such not taken them into our confidence?

6—Have we failed to maintain a proper spread between their wages and the earnings of the men they are required to supervise?

7—Have we failed to accord them the rights and privileges which their positions should merit?

8—Have we, by our actions, given them the feeling that in leaving the protection of a labor agreement and joining the ranks of the supervisor where no such protection exists they are jeopardizing themselves?

9—Have we in the past led too many to believe they were being considered for supervisory positions and then, without any attempt to explain the situation to them, advanced others around them, thus souring many on supervisors' jobs?

10—Is our system of advancement wrong in that we have too often shown that we allow personalities and friendship to influence the selection of men for such advancement?

If we have been guilty of one or all of these then it is no wonder that we are finding that the supervisor's position is no longer attractive. Let me suggest that you members of the Master Boiler Makers' Association start at once to analyze this situation on your own railroads and to do your part to stop any such practices which you find to exist.

These steps need to be taken if the selection and training of boiler department supervisors is to be successfully handled. First, clean house of any existing practices or conditions which tend to make the supervisor's job unattractive. You cannot train a man for nor get him to desire a position which is not attractive to him. Second, learn intimately your present supervision and solicit their assistance in selecting and training men to succeed them. Third, study your problem until you know as nearly as is possible what your supervisory needs are. Fourth, begin now, with the assistance of your present supervisors, to look for supervisory material within your own ranks. Fifth, as soon as possible, begin inducting likely supervisory material into your apprenticeship ranks. Finally, set up a training program which will progressively prepare candidates for supervisory positions to assume those duties when needed.

### Association Work

By E. L. GRIMM

*General mechanical superintendent, Northern Pacific*

Mechanical associations are designed and organized to bring about improvement, both for the individuals participating and for the railroads supporting such associations. They widen acquaintanceships, promote self-confidence, and develop initiative and leadership in individuals. These qualities manifested in supervisors directly benefit the railroads through improved output.

Mechanical associations program and stimulate group study and research and the resulting exchange of ideas and experiences at conventions are later published in the

annual proceedings and technical press for the benefit of all. One of the most important benefits is the development and adoption of standards, and the recommendation of improved practices.

Unquestionably, mechanical associations have played a distinct and valuable part in the development, organization and structure of railroads in the past, and have earned a permanent place in future railroad economy. Were this not true, they would long since have ceased to exist. While the demands of war have limited the activities of mechanical associations, their importance and services will be increased because of the problems that will arise during the post war reconstruction and the periods of keen transportation competition beyond.

## **Training Boilermaker Apprentices**

By B. M. BROWN

*General superintendent motive power, Southern Pacific*

The work of the craft, of which your organization is representative, is most essential to the successful operation of the railroads. In it, a comprehensive and efficient system of apprentice training is necessary to supply the lack of skilled labor now facing the railroads. It is only through apprenticeship and proper apprentice training with assured continuity that we will be able continually to set up new and higher standards of craftsmanship. This must be done by the new blood injected into the organization. If we want future well-trained supervisors, we must begin by properly training our apprentices today. In order to become a real leader, a man must first learn to be a good follower, and the more he knows about his business the better.

Apprenticeship training was greatly retarded on our American railroads during the depression and as a result we have a shortage of master craftsman today. Due to the fact that the full benefits of such a training program are not attained for many years, the subject calls for intelligent, long-time planning.

The interviewing, qualifying, and selecting of applicants is an important function. When a young man, who is sincerely interested in his future, applies for an apprenticeship, he must be given conscientious guidance for his full time of apprenticeship. Apprentices must be advanced from one series of operations to another under the direction of skilled workers and instructors in accordance with a planned sequence of work processes until they have mastered their chosen craft. It is advisable to have a supervisor of apprentices in every large shop.

Shop schedules for apprentices should be worked out for each craft in line with the facilities at each shop or point where apprentices are employed. Through experience, the length of time normally required for mastering each job operation has been set. The employer and the journeyman know in general what this schedule of job operations should be. The apprentice and his parents know only the end result desired. He must be instructed in mathematics, trade science, blue-print reading, mechanical drawing and other subjects pertinent to his craft. Employers should see that the apprentice gets a rounded work experience on the job and the necessary hours.

It requires time for the apprentice to reach his maximum capacity for all-around skill because he is less experienced than the journeyman. Because as a younger man he may be less careful, the apprentice should be given special instruction in safety on the job. We must give apprentices a thorough and intensive technical training for there are many things which they cannot learn by

practical experience. Competent instructors are necessary. The school where training is done should keep in close touch with the industry.

Many an apprentice has been discouraged from mastering the art of his craft through lack of interest on the part of the immediate shop management. Under such conditions, the apprentice has to fight all kinds of trouble single-handed. Some of them come out all right by force of ability and determination. It is the responsibility of management to show an interest in these boys. Most of them are ambitious and are willing to conform to any reasonable standards if we will take the initiative in encouraging them and make it possible for them to conform to the standard set. It is logical to expect that boys will put forth their best efforts when they know every effort is made to arrange all the conditions favorable to their training. There is something very human in the response to the feeling of "getting a good break."

Apprentice training of the future must be something more than has been attempted on any wide scale in the past. The duty and responsibility of training skilled labor must be assumed by the management of railroads and public-spirited companies, and also by organizations representing the employees. Apprenticeship must be made more attractive in order to draw a good type of youth who can best profit from the training.

It is possible for apprentices to attend evening classes and to profit from them either in broader culture or greater skill in their occupations. Better co-operation with trade schools and vocational courses in public schools will help our apprentice system. Some vocational work attempted in schools has failed to win industry's respect but there are cases in which excellent work has been done in the way of preliminary instruction and development of aptitudes for learning. Industry's co-operation will help to improve and expand this work and make it of greater practical value to both employer and employee. Public school cooperation in the teaching of theory can also be made a valuable adjunct.

The present trend in shop practice encourages the development of specialists rather than all-around skilled mechanics. This has been one of the factors working against the restoration of apprentice training to its former high standard. This fact, in addition to others, such as the expense involved in training men who may ultimately resign after being trained are problems we must be prepared to meet. Adoption of uniform standards in the matter of hours of shop work and study, time to be spent in the various stages of training, rates of pay, and attainments to be required for a certificate of graduation, together with adequate supervision over the training program, can help materially to assure the usefulness to industry of the product of these courses. The needs of industry, not next year, but five years and ten years hence, must be planned for now. Measures for meeting this situation cannot be adopted and put into use too soon.

What about the mechanics of tomorrow? The number of apprentices was greatly reduced during the depression years and, in an effort to hold down expenses, training systems were largely thrown into the discard or greatly curtailed. This has resulted in a serious lack of skilled men to meet the greatly expanded demands of the present emergency. These facts are generally recognized and have been a matter of great concern to railroad mechanical department supervisors. The difficulty is accentuated by the fact that marked progress has been made in locomotive and car design to meet the exacting present day and post-war conditions and higher standards of workmanship must be insisted upon in the future. Apprentice

*(Continued on page 152)*



Why The

# Geared-Turbine Locomotive?

THE first geared-turbine steam locomotive in America represents outstanding advancement in American railroading. Although new developments usually are first designed and built on a relatively small scale, the new geared turbine locomotive, with a rating of 6,900 shaft horsepower, is one of the most powerful high speed locomotives in the world. Thus, not only did the participating parties undertake the construction of a radically

By Charles Kerr, Jr.\*

The characteristics of the steam turbine adapt it as a prime mover of high-speed, high-capacity motive-power

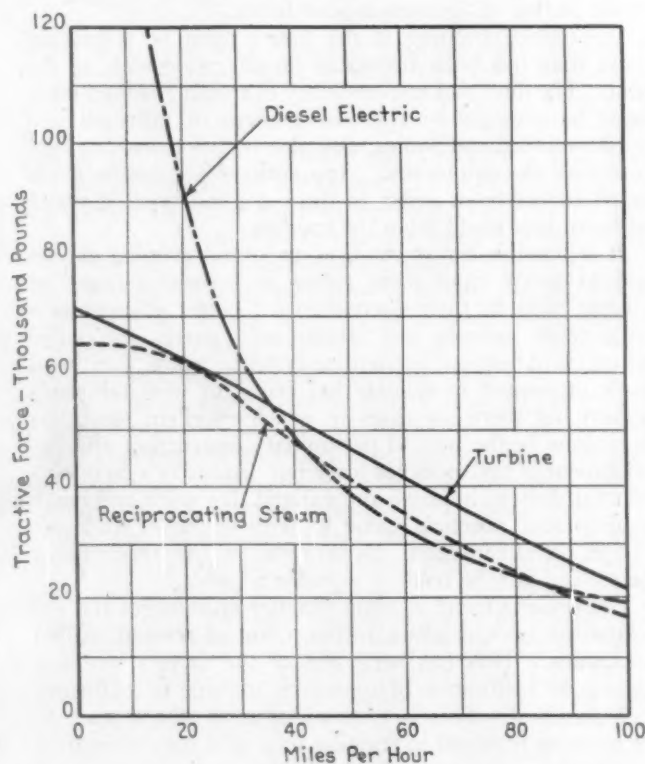


Fig. 1—Tractive force at the rail for the steam-turbine, a reciprocating steam, and a Diesel-electric locomotive

new locomotive, but also one of exceedingly high horsepower capacity.

The propulsion equipment of the Pennsylvania Class S-2 locomotive was designed specifically to operate with a conventional fire tube boiler, and at pressures and temperatures commonly used with such boilers. Furthermore, it was designed for a locomotive which would be used primarily in high-speed passenger and freight service. Fig. 1 shows the speed-tractive force curve compared with that for a conventional two-cylinder re-

ciprocating steam locomotive, with the same weight on drivers and with a boiler designed for equal evaporation. At standstill and at the slower speeds, the performance of the two is essentially the same, but at the higher speeds, the tractive force of the geared turbine unit becomes considerably greater. Thus for the same amount of steam consumed it can handle a larger train at the same speed, or an equivalent train at a higher speed.

In Fig. 2, the horsepower developed at the rail is shown both for the turbine drive and for a conventional reciprocating locomotive where each have the same capacity boiler. The turbine locomotive produces at the rail a maximum of 6,550 hp. against 5,630 hp. for the reciprocating locomotive. At 100 m. p. h. the turbine horsepower

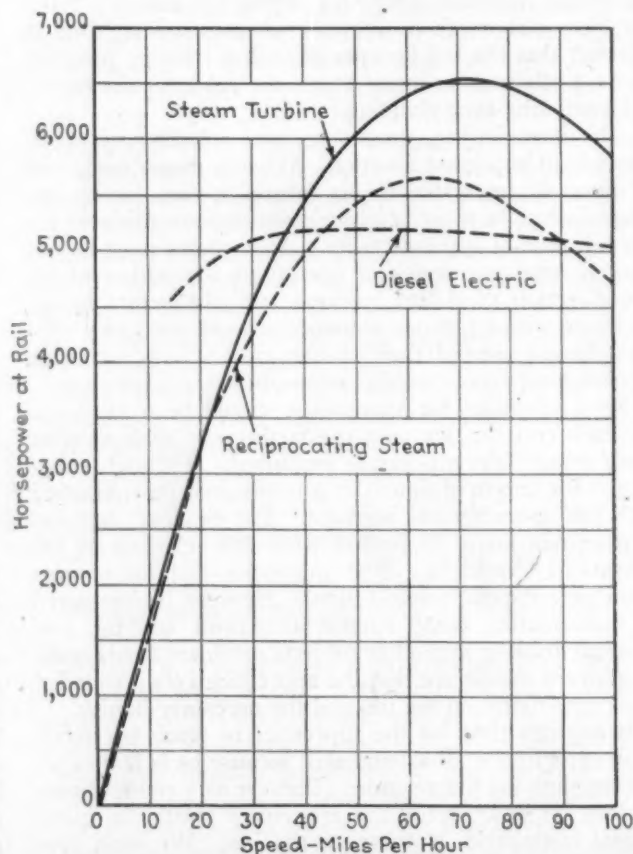


Fig. 2—Horsepower at the rail for a steam-turbine, a reciprocating steam, and a Diesel-electric locomotive

Table I—The Class S-2 Turbine Locomotive and 6,000-hp. Diesel-Electric Locomotive

	Class S-2	Diesel electric
Total weight, lb.	1,029,400	1,039,000
Weight on drivers, lb.	260,000	693,000
Overall length, ft.-in.	122-7 1/2	223-0
Starting tractive force, lb.	70,500	173,000
Prime mover horsepower for traction	6,900	6,000
Maximum rail horsepower	6,550	5,200
Locomotive weight, lb. per hp.	152	200

\* Consulting Transportation Engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



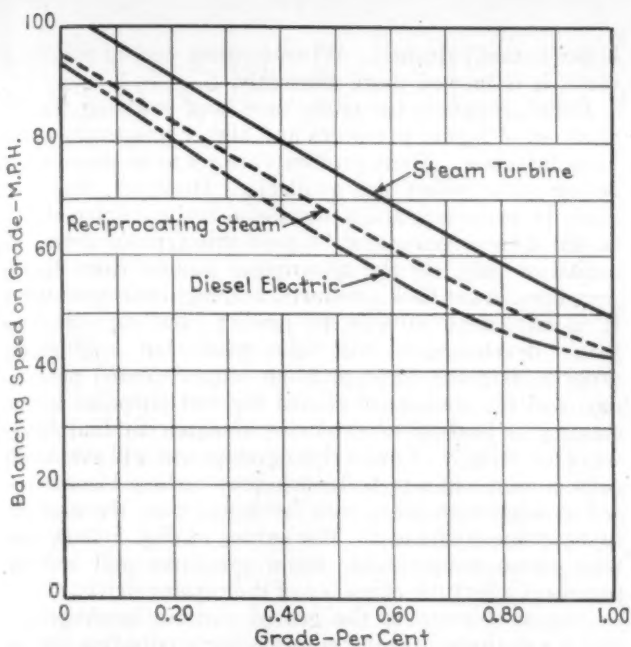


Fig. 3—Balancing speed on grades for steam-turbine reciprocating steam, and Diesel-electric locomotives

is 5,820 against 4,750. As railroad speeds are continually raised, the larger outputs at the higher speeds become of greater importance.

The largest Diesel-electric passenger locomotive built is a three-unit locomotive developing 6,000 Diesel-engine hp. The performance curve of this Diesel-electric is also shown on Figs. 1 and 2 for comparison. The Diesel produces a very high initial starting tractive force due to the electric transmission, but suffers in capacity at the higher speeds. Table I further compares a 6,000-hp. Diesel-electric with the Class S-2 turbine locomotive.

With the tendency towards lightweight rolling stock, many have questioned the wisdom of the large capacity

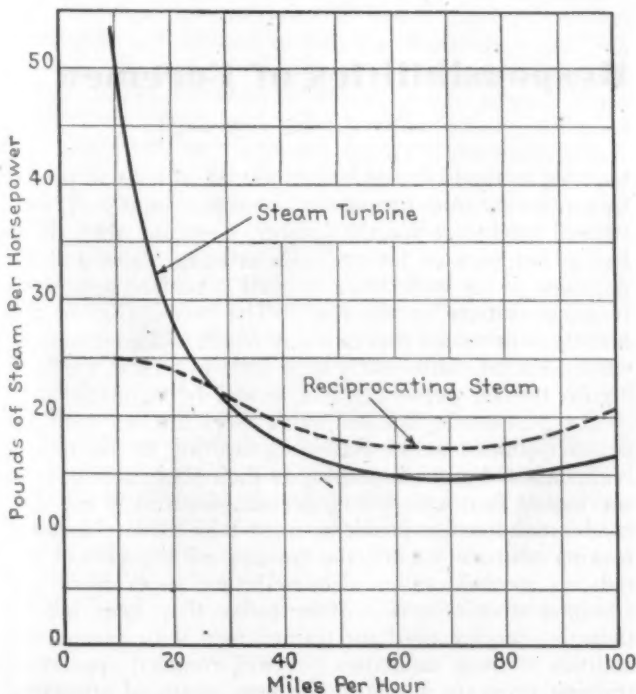


Fig. 4—The steam rate in pounds per horsepower at the rail for the steam-turbine and a reciprocating steam locomotive

Table II—Time in Minutes to Accelerate a 1,200-Ton Train to Various Speeds

Speed, m. p. h.	Type of Locomotive		
	Class S-2	Reciprocating	Diesel
70	5.12	5.81	5.63
80	6.80	8.18	8.50
90	9.46	13.26	14.26
100	16.00	A	A

A—Maximum speed approximately 95 m. p. h. with 1,200-ton train.

locomotives. An essential of high schedule speeds, both in freight and passenger service, is not only the ability of the locomotive to maintain these high speeds on level track, but also to maintain speeds on adverse grades, and to accelerate rapidly from station stops and slow-downs. Fig. 3 shows the speeds which can be main-

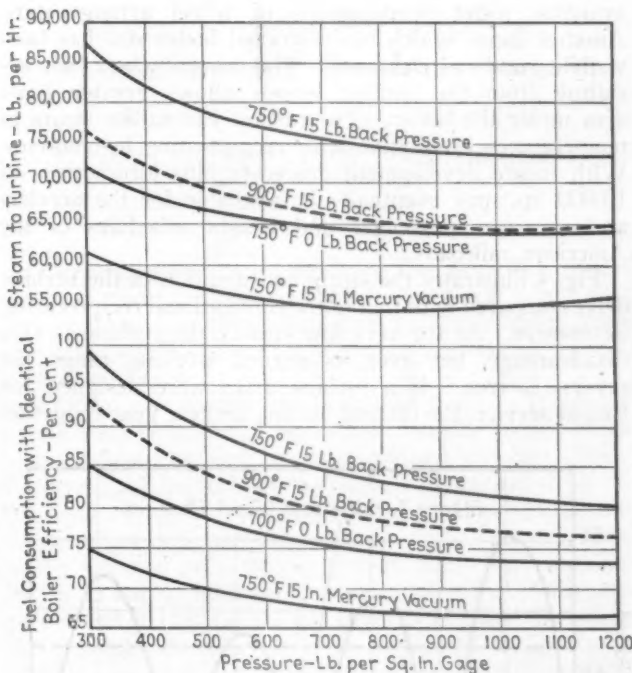


Fig. 5—The effect of steam conditions on the fuel and steam consumption of a 6,000-hp. geared-turbine steam locomotive

tained by the three locomotives on grades ranging from level track to 1.0 per cent when hauling a 16-car 1,200-ton train and when supplying the power for air conditioning the cars.

Table II shows the time in minutes required by these same three locomotives to accelerate this same 16-car train from standstill to various speeds on level track.

Table III—Horsepower Required to Handle Freight Trains at Various Speeds on Level Track

Speed, m. p. h.	3,750 tons, 75 cars	5,000 tons, 100 cars
	Horsepower	Horsepower
40	2,370	3,110
50	3,610	4,720
60	5,270	6,910
70	7,370	9,630

This ability to accelerate the train rapidly, when multiplied by numerous stops and slowdowns, results in a very material overall increase in average speed, and hence in improved passenger appeal.

In the postwar period, high-speed freight service will receive equal rank with high-speed passenger service in the railroad's fight to keep the traffic on the rails. The locomotive rail horsepower required on the very best roadbed to handle large freight trains at various speeds is given in Table III.

A brief glance at these requirements readily shows

that the day of the large locomotive is far from being over, and that a development such as the turbine drive, which increases the capacity of the steam locomotive, will be most welcomed by the American railroads.

As experience is gained with the geared-turbine locomotive, it seems highly probable that even larger turbine locomotives will be produced. When all is said and done, the ultimate limit in the capacity of the steam locomotive is the boiler. It is not generally realized, but the turbine drive removed many of the present limitations now imposed upon the boiler designers who, with this type of locomotive, will enjoy a latitude previously denied them. With the geared-turbine drive, locomotives can be built with smaller wheels, the use of which may to some extent afford boilers of larger diameter, and also make available wider combinations of wheel arrangements. Another factor which has restricted boiler size has been visibility and rail clearance. The shorter wheel base resulting from the smaller wheels allows greater grate area under the boiler. The turbine can utilize steam at temperatures prohibitive with reciprocating locomotives. With future development geared-turbine locomotives of 10,000 hp. may eventually be available for the accelerated post-war passenger and freight schedules of the American railroads.

Fig. 4 illustrates the steam consumption of the turbine drive compared with that of the conventional reciprocating locomotive. At the very low speeds, the turbine is at a disadvantage, but over its normal working range the reverse is true. If a turbine drive were designed for freight service, the turbine blading and the gear reduction

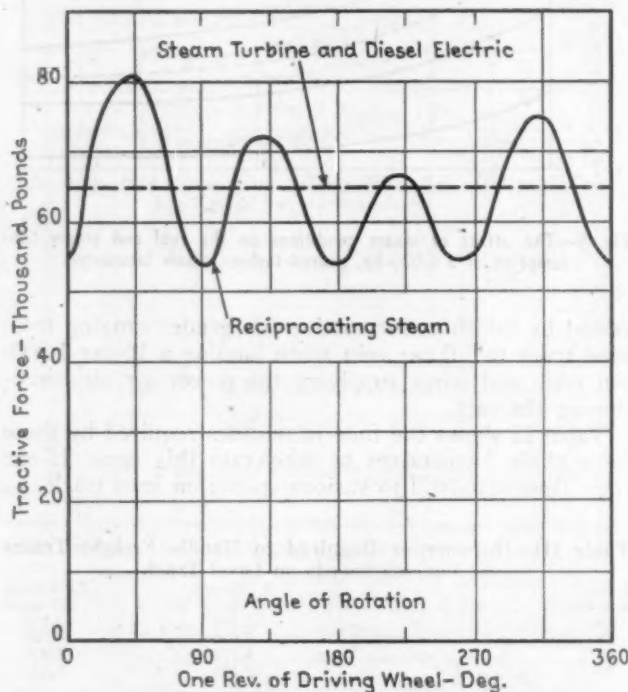


Fig. 6—Torque curves for the steam turbine, reciprocating steam, and Diesel-electric locomotives

would be made more favorable for low-speed efficiency, improving the steam-rate efficiency compared with the performance shown by Fig. 4.

Besides having a better steam rate, the Class S-2 locomotive also utilizes the coal burned in the boiler efficiently. Due to its small wheels and short driving wheel base, it has been possible to equip this locomotive with a large boiler and a large grate. When developing full output, coal is burned at a low rate and the

boiler is easily drafted. When burning coal at the lower rates, it is burned more efficiently.

Boiler designers for years have been studying the application of higher pressures and higher temperatures for locomotive use. Many problems are yet to be surmounted before such boilers are available. However, they will likely be perfected, and a successful turbine drive should hasten their development because this type of drive can capitalize fully on the advantages gained from higher pressures, lower back pressures, and higher temperatures. It is extremely difficult to predict how rapidly these boiler developments will take place, but engineering progress is going forward at an unprecedented pace today, and the abundance of coal for fuel purposes in this country is leading to extensive research to find better ways for using it. Out of this development will eventually come a more efficient boiler whereby turbine locomotives will emerge with economies far better than those of the first turbine equipment. The curves of Fig. 5 show how total steam temperature, steam pressures and exhaust pressures affect the efficiency of the turbine drive.

Another feature of the geared turbine locomotive is that it substitutes a uniform torque for a pulsating torque. Fig. 6 shows the torque over a complete wheel revolution for a turbine locomotive and a reciprocating locomotive. Without a reciprocating motion, the rotating elements of the turbine drive can be perfectly balanced, eliminating the undesirable features of unbalanced moving parts.

The turbine locomotive will use either coal or oil as a fuel. In various parts of the country, there are definite economic reasons dictating one or the other as the preferred railroad fuel. Therefore, this is a prime mover which can be used by any railroad wherever located or whatever its source of fuel.

The experience which has been gained in the design and operation of this locomotive indicates that the geared-turbine drive may go far towards revolutionizing the steam locomotive. Its performance characteristics make it a worthy form of motive power for high speed, freight and passenger service where locomotives of large capacity are required.

## Responsibilities of Foremen

(Continued from page 149)

training methods should be introduced which will protect this situation and furnish an adequate supply of well-trained mechanics for the future. Certainly there is no lack of evidence on the railroads as to the value and importance of the work done by well organized apprentice training systems in the past. The resumption of this activity is necessary and in a way which will meet modern conditions, on a sufficiently large scale to furnish the more highly trained personnel which will be required later.

The best mechanics and supervisors are our own apprentice-trained men. Railroads desiring to maintain a high standard of workmanship in their shops and to have services of men with a deep personal interest in the railroads' maintenance problems must take a more forward looking attitude toward the training of apprentices not only as mechanics but also as future supervisors and administrative officers. More today than ever before, there is a crying need for trained men with exceptional abilities in these capacities. A well-rounded apprentice training program is one of the best means of attracting young men into the ranks and starting them on the road to meet these higher responsibilities.



# Wheels for Postwar Service\*

By C. T. Ripley†

**EXPERIENCED** railroad men know the importance of wheel and axle work in railroad operation from the safety viewpoint. The wheel and the axle are the most important parts of a car or locomotive, for their failure can cause the most serious type of wrecks due to equipment defects. Because of this fact both the manufacturers and users must continually strive for improvements to cut down the chance of such occurrences even though the present performance record is remarkably good.

Wheel and axle work is also important from the cost viewpoint. Anyone who handles interchange billing realizes how large a percentage of the bills involve wheel charges. In order to arrive at an approximate figure for the cost of wheels and wheel shop work, I have analyzed the expenses of one large railway system and developed the following data: Annual cost of wheels for locomotives (excluding tires), \$210,000; passenger-car wheels, \$115,000; freight-car wheels, \$1,275,000; wheel-shop work, \$510,000; total \$2,110,000.

In the case of the freight-car wheels, the cost represents about 12 per cent of the total maintenance charges. It is realized that these costs will vary on different railroads, but, if we apply the results of this estimate proportionately to the total car and locomotive ownership of American railroads, we arrive at a total estimated cost for all railroads of about \$6,000,000. (Mr. Ripley here described at some length the results of intensive research conducted by the Wrought Steel Wheel Industry and outlined the characteristics of steel wheels adapted to meet modern service requirements for steam locomotives, Diesel locomotives, passenger cars and freight cars.—EDITOR.)

While the steel wheel industry intends continually to develop improvements in all these types of wheels, it appears that it is already well prepared to meet post-war demands. However, it must be recognized that no one type of wheel can be used in every class of service. Judgment must be used in the selection of the types best suited to the service. This has been recognized by the A.A.R. in its specifications for heat treated wheels, which divide such wheels into three classifications: Class A, a low-carbon wheel for use with severe braking conditions, but with light loads; Class B with medium carbon content for use with severe braking conditions and heavier wheel loads; Class C with high carbon content for use with high wheel loads and moderate braking conditions. These three new classes are in addition to the ordinary unheat-treated wheels covered in the old specifications.

The maximum loadings recommended for these classes of wheels when used in locomotives or passenger cars are as follows: Class A, 650 lb. per in. of dia.; Class B, 750 lb. per in. of dia.; and Class C, 800 lb. per in. of dia.

Another phase of the wheel service problem in which car men are directly interested is shop practice. Post-war service is going to require the very best shop practice. Even though the wheels may be right for the service, if they are properly machined and mounted, service performance will not be satisfactory. We all recognize that great improvements have been made in wheel-shop practice. The A.A.R. Wheel and Axle Manual has served as a most helpful guide and the A.A.R. inspectors who are

**Wheel maintenance is responsible for one-eighth of total freight-car maintenance charges — Importance of rotundity and freedom from eccentricity calls for accurate wheel-shop equipment**

now surveying the shops are doing fine work, but nevertheless I think most wheel-shop foremen will admit that they still see continued evidence of questionable shop practice, such as tapered wheel seats, mismated wheels, poor wheel fits, etc.

My own observation has been that much of this poor practice can be traced to inadequate machine tools. Much of the wheel-shop equipment is old and obsolete. New machinery of modern design should be provided to do the kind of work which will be necessary. Many old wheel lathes will not turn wheels truly round. Axle lathes will not do a proper job on the wheel seats or journals; boring mills will not bore wheels centrally, regardless of constant checking. Now is the time to replace this old equipment so as to be ready for the post-war period.

A major point which I have always fought for is that of providing true rotundity in wheels. The higher the speed of operation, the more vital this is. I have seen repeated proofs of this, particularly in passenger-car operation and the same applies when freight-car operation is speeded up. Wheels must be truly round when applied and must be maintained in this condition. For this reason I have always advocated grinding after mounting regardless of whether the wheels had turned treads or otherwise. If grinding machines are not available wheels should be swung in the lathe and a light cut taken. The new type grinding machines which are set at floor level make this operation simple, quick and inexpensive.

Better riding, less wheel sliding, less wear and breakage of truck parts and less hot boxes, will be the net result of keeping wheels more truly round.

From an expense viewpoint, the exact mating of wheels is most important. An analysis of wheel removals indicates that about 40 per cent of the wheels are turned for sharp flange. Sharp flanges result from a number of causes but the predominant one is difference in diameter of the two wheels when they start in service. The ideal mark to shoot at here is to mate within .005 in. of equal diameter. Ordinary taping permits of only half-tape size mating, but this is not in my opinion sufficiently accurate, particularly for high speeds. Poor center-plate lubrication also increases flange wear, and also trucks out of square, but I think that if you mate wheels accurately, 75 per cent of the sharp flange development can be eliminated.

(Continued on page 155)

\* Excerpts from a paper on this subject presented before the December 11 meeting of the Car Foremen's Association of Chicago.

† Chief engineer, Technical Board, Wrought Steel Wheel Industry, Chicago.



## Higher Boiler Output--

# Increased Cinder Cutting\*

By E. E. Owens†

**I**N his introduction the author reviews the history of the growth of the size of the steam locomotive and the steady increase in the demands on the boiler for the past forty years.—EDITOR.

The 4-12-2 type locomotives on the Union Pacific were built with 99.98 sq. ft. of grate area, 220 lb. working pressure, 259 3½-in. tubes and flues 22 ft. long, stoker fired end equipped with Type E superheater and feedwater heaters. These were the largest freight locomotives ever built for use on our property and engineers were at first reluctant to work them to capacity for speed. There was no cinder cutting damage to firebox sheets, staybolts or flues, but the life of netting, blowers, stacks, and plates in the front end was reduced quite noticeably. It was necessary to change the netting in three to four months, blowers and stacks at 120,000 to 150,000 miles. We obtained up to 150,000 miles before it was necessary to change flues and then it was not due to cinder wear.

In 1927 and 1928 demands for faster movement of freight increased the speed of all trains, and cinder cutting developed at the firebox end so that at 85,000 miles it was necessary to renew 96 to 100 flues in the cinder-cutting area at the top center of the back tube sheet. At 120,000 miles it was necessary to change all the flues, the back tube sheet and 150 to 200 crown stays over the arch. The life of the netting was reduced to 60 days, blowers and stacks to 8 to 10 months. Holes were also cut through superheater units where cinders deflected around the support bands and through the riser shields.

In an effort to reduce these damaging effects we lowered the arch tubes at the door-sheet end 8¾ in., increased the length of the brick arch from the Gaines arch wall back to eight courses, allowing 125 per cent of the gas area through the flues between the top of the arch and the crown sheet; did away with the cap brick on top of the Gaines arch wall; increased the air opening between the ashpan wing plates and the mud ring from 12 to 13 per cent of the grate area; did away with face-plate netting clean-out doors at the sides of the ash pan along the mud ring; applied instead solid plate doors from the ash pan wings up to even with the mud ring, with a 7-in. opening between the face of the clean-out doors and the wrapper sheet.

Crown-sheet and crown-stay cutting were eliminated. The life of the flues and tubes was increased to 120,000 miles before changing any in the cinder cutting area. At this mileage we now change 96 to 110 flues and tubes and continue the engine in service up to 200,000 miles before changing flues and tubes and the back flue sheet.

A program was started in 1928 converting the Mallet compounds to simple articulated locomotives. With the increased capacity thus brought about cinder cutting has developed to the extent necessary to remove approximately 28 5½-in. flues and 50 2¼-in. tubes at 35,000 to 40,000 miles and to renew all the flues and tubes and back flue sheet at 80,000 miles, as compared to no cinder cutting damage to the fireboxes and 80,000 to 100,000 flue miles prior to converting.

To date we have found no arrangement of brick arch which will reduce this cinder-cutting action. We have experimented with the front end arrangement, both with multiple-jet nozzle, with labyrinth front-end arrangement, and with the Master Mechanics' front end arrangement. Increased speed and tonnage and the additional coal consumed result in an excessive amount of unburned fuel and cinders passing through the firebox at a velocity we as yet have been unable to control.

At this time the speed made by the Santa Fe type locomotives was stepped up and cinder cutting developed.

The 4-8-2 type passenger locomotives were crowded into higher speeds and required to haul an additional car or two. This resulted in developing cinder cutting in fireboxes, flues and tubes, units and other parts.

Similar changes to those made in the 4-12-2 type were made in the 4-8-2 type passenger locomotives. The results were not as good as were obtained in the 4-12-2 type locomotives, but there was some improvement. One of the fireboxes in this class of power was equipped with the Security circulator, and the results obtained in reducing the cinder cutting were very satisfactory.

During this period all of this class of power was equipped with a new front-end arrangement, discarding the Master Mechanics' front end, Sweeney-type exhaust nozzle and small-diameter stack, and installing a four-jet exhaust nozzle, a large-diameter stack and blower and a labyrinth front-end arrangement. To improve combustion the firebox sides were equipped with air ducts, engines were also equipped with 12 per cent Firebar grates. The results of the above modifications were a more powerful locomotive capable of hauling another car or two at higher speeds. This, in turn, resulted in a decided increase in cinder-cutting action which damaged flues, tubes, back flue sheets, superheater units, front-end plates and smokebox fronts.

However, the locomotive of this type which is equipped with the Security Arch Company's circulators still continues to give satisfactory performance after modifications made to the front end in May, 1941. At this time, flues have made approximately 260,000 miles and it is estimated that we will get another 75,000 to 100,000 miles without trouble as compared with 100,000 to 110,000 flue miles in the cinder-cutting area and all flues, tubes and back tube sheets renewed at 225,000 miles.

The 2-10-2, 2-8-2 and heavy 4-6-2 type locomotives have all had similar changes, with the same satisfactory results of greatly improving the capacity of the locomotives and the same disastrous cinder-cutting damage to fireboxes, flues, tubes, units and front ends.

Our 4-8-4 type passenger locomotives built in 1937 have 100 sq. ft. grate area, 201 2¼-in. tubes, 58 5½-in. flues 20 ft. 6 in. long, 300 lb. working pressure, Type A superheater and Standard BK stokers. These engines carry an arch with 125 per cent flue gas area between the top of the arch and the crown sheet, four-jet exhaust

\* Abstract of a paper prepared for the 1944 Proceedings of the Master Boiler Makers' Association.

† General boiler inspector, Union Pacific.

nozzles, labyrinth front end arrangement and secondary air openings in the side sheets above the fire bed.

Cinder cutting of flues, tubes, back tube sheets, units and front ends increased to the extent that it was necessary to change part of the flues and tubes at 110,000 miles, and all of the flues and tubes and the back flue sheets at 225,000 miles.

In 1939 we built 15 more of these engines. These have 100.2 sq. ft. grate area, 300 lb. working pressure, 50 2¼-in. tubes, 184 3¼-in. flues, 19 ft. long, and Type E superheater. The same area proportions were held above the arch and in the front ends as in the earlier lot and they were equipped with two exhaust nozzles and two smokestacks. These engines gave the same efficient performance with slightly less cinder cutting of flues and tubes. But we experienced more failures of flues due to cinders cutting holes through the walls of the flues adjacent to the unit supports and bands than on the engines equipped with the Type A superheater. Unit support bands were eliminated about two years ago. This enables us to see the extent of the cinder cutting progressing from the firebox end of the flues and has eliminated the failures.

In 1941 and 1942 our heavy freight power was built. These are the 4-8-8-4 type having a grate area of 150 sq. ft., 300 lb. working pressure, 75 2¼-in. tubes, 184 4-in. flues, 20 ft. long, Type E superheater, Standard MB stoker, seven Security circulators, the same gas-area proportions, secondary air openings in the side sheets, and front ends equipped with two four-jet exhaust nozzles and two smokestacks.

Cinder cutting has caused damage to all the crown stays over the arch and in the radius of the crown sheet the full length of the arch and the combustion chamber; the riser tubes of circulators are cut from the crown sheet down 16 to 18 in. Fire-door side tubes, and flues across the top and down each side of the flue sheet are cut. A total of 34 flues and 38 tubes were damaged to the extent necessary to change them at 40,000 to 45,000 miles and it is necessary to change all flues and tubes and the back flue sheet at 90,000 miles.

We have prolonged the life of the circulator riser tubes by welding strips of ¾-in. rod, 1½ in. apart to the back side of the tubes extending from the crown sheet down approximately 22 in.

We have prolonged the life of the staybolts and crown bolts above the arch by fillet welding ¾-in. or ¼-in. round wire, cut 2½ in. long in the form of a horse shoe, to the sheet ¾ in. to 1 in. back of each bolt head.

In our 4-6-6-4 engines built in 1942 and 1943, cinder cutting to the fireboxes and other related parts is about the same as in the 4-8-8-4's; it does not develop at such a rapid rate, however. We are protecting the crown stays and staybolt heads and riser tubes of the circulators by welding on shields similar to those applied to the 4-8-8-4 fireboxes and circulators.

Cinder cutting of crown sheets and bolts seems to be governed by height and length of brick arches in engines having fireboxes up to 184 in. long, 108 in. wide, and combustion chambers up to 76 in. in length, and working pressures to 220 lb.

Cinder cutting of crown sheets, bolts, flues and tubes, and flue sheets can be retarded by the application of Security circulators in fireboxes up to 126 in. long, 96 in. wide with 76-in. combustion chambers and working pressure of 200 lb.

Cinder cutting of crown sheets and crown bolts above the brick arch in fireboxes up to 235 in. long, 96 in. wide, 106-in. combustion chambers and 250 to 300 lb. working pressure can be controlled by the application of shields back of the bolt heads.

## Wheels for Postwar Service

(Continued from page 153)

If wheels can be worn evenly in treads, wheel mileages will be nearly doubled and a large saving made possible.

Incidentally, the accurate wheel work which I have mentioned will also help in cutting down hot boxes. Wheels which crowd to one side, producing sharp flange, cause rubbing of the journal brass against the axle collar or fillet. It has even been recommended that some A.A.R. rule be made to require the removal of wheels which have so-called double flange on one side, which in turn means a rapidly wearing flange on the opposite wheel. Wheels which are out of round tend to bounce more or less and this increases the chance of waste grabs.

Improved shop practice through the use of better machinery and close supervision will improve post-war operation and effect large economies in wheel costs.

I have been engaged in testing of railroad materials and devices in one way or another nearly all my working life. Accelerated tests in laboratories have their drawbacks because there is always some question as to whether service conditions are actually reproduced. On the other hand, road tests have their drawbacks because of difficulty in keeping records and the interference caused by operating conditions and requirements. I have felt for many years that it would be a great thing if the A.A.R. had a section of railroad for testing purposes only. If about 30 miles of track could be built in the form of a circle or a figure eight loop, equipped with necessary instruments, laboratories, etc., it would be possible to make accelerated tests of important railroad materials, such as rail, fastenings, ties, ballast, trucks, wheels, axles, brake shoes, etc.

If the often duplicated costs in many individual laboratories and road tests could be reduced by this central testing plant, the information from which would be available to all railroads, there would probably be a saving over present practice.

One by-product of this war period which has been a definite advantage to both wheel makers and users has been the standardization of designs of wrought-steel wheels. Formerly there were about 450 designs of steel wheels for all classes of service. This was reduced to 34 standard designs and 24 standards for use only on existing equipment and which will be unnecessary on equipment built in the future. There are also a considerable number of designs necessary for use with A.S.F. roller-bearing units which were not originally designed for use of wrought-steel wheels. Most of these will probably become unnecessary before many years. Storekeepers, as well as shop foremen, will recognize the advantage in reduction of stocks of wheels by the standardization. Correspondence has also been cut down in the ordering of wheels.

I sincerely hope that after the limitation orders of the government are removed, the railroads will not fall back into the old practice of paying little or no attention to standardization. There will, of course, be times when some new standards will be necessary; on one desires to block progress. These should not be governed by the whim or fancy of some individual engineer, but should be reviewed by the able committees of the A.A.R. and either found necessary or unnecessary. I appeal to you as railroadmen in your own best interests to do whatever you can to hold to reasonable standardization of wheel design. (Mr. Ripley here presented a number of large charts illustrating standard taper versus cylindrical tread contour, reclamation of one-wear wheels, spacing of wheels for various services, etc.—EDITOR.)



# EDITORIALS

## Keep Up Inspection Standards

Recently a car foreman, in discussing his need for additional help, said that his greatest need was for some "depression days" car inspectors. He recalled the days when A. A. R. car billing often represented a substantial income and he wanted more of the type of inspectors who were accustomed to checking cars thoroughly.

That this need extends throughout the country seems apparent from the number of times within the past year when the Mechanical Division found it necessary to call on A. A. R. member roads for greater care in inspecting cars. Many cars have been found arriving at terminals under load although they were in unserviceable condition because of defective floors or stringers, broken or corroded body bolsters, broken, bent or otherwise defective center sills, broken, bent or weak side sills, and broken or corroded cross-bearers. Repeated attention has been directed to giving proper inspection and lubrication to journal boxes. Special instructions have been required to attempt to have close inspection given to truck bolsters and side frames which have been failing under service conditions although the cracks which caused failure have been disclosed in many cases to have been of long standing and located where they were discoverable. Mechanical Division circulars on inspection and repair of tank-car equipment have been numerous.

Many of the defects to which the various circular instructions refer formerly called for shop tickets which took cars out of service either for light or heavy shop attention, most of the others required some time on the rip tracks. Now such cars are running in such numbers that general instructions are needed to call attention of all roads to them. The lack of a sufficient number of trained inspectors probably accounts for many defects going uncorrected at the time when correction is first needed. Whether this lack accounts for all of such cases is questionable; urgent need of cars probably causes many to be loaded without any inspection, time limits on delivery of loaded materials often leads to temporary blindness when setting a car out of a train would be required for correction of a seemingly minor defect and a general slackening of maintenance standards may mislead inspectors as to what should be passed and what must be attended to immediately.

This last, it seems, is most important when the bad-order percentage of the past several years is considered. As low at one time recently as two-and-a-half per cent, it is currently at three per cent. This does not mean, however, that the freight-car inventory of the country is in the best condition of its history. Standards have

been lowered. Care must be taken to see that safety does not become involved.

As standards of maintenance decline it will be more than ever important that the standard of inspection remain as high as it is possible to keep it. Responsible supervisors must make still further efforts to see that men at inspection points understand what conditions must not, under any circumstances, be allowed to get by. The extent to which supervision is successful in doing this will determine largely how long the railroads can continue to keep the present high percentage of their cars in service.

## Status of Train Communication

In making frequency allocations to the various classes of non-governmental services in the radio spectrum, the Federal Communications Commission has shown fairness, thoroughness and broad understanding. The railroads have accepted the Commission's proposals with requests for only minor changes. The principal one of these is that they be allowed 100-kilocycle rather than 60-kilocycle band widths in the 156-162 megacycle range, since under the present development of high-frequency communication equipment the narrower band would increase costs and operating difficulties.

The Commission's record justifies the assumption that it will continue to cooperate with those agencies which make adequate use of their assignments. There is good reason to believe the railroads will do this. Some of them will probably make extensive applications, with full knowledge that future developments may indicate the desirability of their moving into another part of the radio spectrum.

Aside from needed technical developments, there remains also the need for working out operating rules. Manifestly, it would be impracticable to require that all users of train telephones be licensed radio operators, but trainmen, etc., will require some kind of certification to show that they understand operating requirements and know the limitations of conversation which can be put "on the air." If such training of operating personnel can be conducted by the railroads to the satisfaction of the Commission, much time and traveling can be avoided. Licensed technicians will, of course, be required who are capable of maintaining transmitter outputs within prescribed channels.

Another situation which needs clarification is one



which has been created by two railroads making application to the Interstate Commerce Commission for permission to install train communication. The I. C. C. passed on these applications with formal orders. When a railroad makes such a request, it would be less than courtesy for the Commission to ignore it. On the other hand it would appear from a reading of Section 25, known as the Signal Inspection Act, of the Interstate Commerce Commission, that it was not intended to include communication systems. It is expected that other roads will make no such application and if this also meets with I. C. C. approval, a situation which has caused some disturbance among prospective users of train communication will be clarified automatically.

Once these questions are disposed of, and the Federal Communications Commission has made its assignments, rapid progress can be expected. Much useful technical information is already available, and with freedom to act, the railroads which have declared their intention to use train communication will be in a position to make free choice of various types, including both space radio and inductive systems.

## Undesired Emergency Brake Applications

At the December 18 meeting of the Northwest Locomotive Association in St. Paul, Minn., considerable pertinent information about the operation of airbrake equipment, particularly in high-speed service, was presented. Following the principal paper by R. G. Webb, superintendent of air brakes, Chicago, Milwaukee, St. Paul & Pacific, one of the points emphasized in the discussion was the perennial question of how to locate a "dynamiter", or car subject to undesired emergency brake action, in a long freight train after it is stopped. An associated question related to what method of brake handling, if any, can be used to prevent a known bad-acting car with this particular defect from disrupting train operation by going to emergency when a service brake application is made.

Experience has apparently failed to develop any infallible means of locating a dynamiter on the road unless there is a blow at the retainer or through the valve, or the brake fails to function normally in conjunction with other cars of the train. Even cutting the train into small sections and making a series of brake-pipe reductions appears to be seldom successful in pointing out the defective car, primarily for the reason that train-line pressure, leakage and other factors which may have a bearing on undesired emergency brake action in a long train are not the same in a short cut of cars.

When the presence of a car subject to undesired emergency brake action is suspected in a train, the enginemen on many roads follow the practice of slightly overcharging the train-line before beginning a service

application. The best that can be said for this practice, which is by no means new, is that it sometimes works, but obviously not when the dynamiter is in the center or rear of a long train, for the overcharge does not normally reach that far back in the train. Moreover, while a slightly overcharged train line may help in making a sticky triple valve move, the overcharge in itself tends to promote emergency action and the building up of brake cylinder pressure in other cars of the train which have normally functioning brake equipment, including Type AB.

In questioning the necessity or desirability of the practice just described, Mr. Webb made the following pertinent comments: "If the car that is causing the trouble is near the head end of the train, and the cause is a sluggish operating valve, of which we have a few, then by overcharging the brake-pipe just before the application it is possible that the slide valve will be moved to retarded release position, breaking the static friction just before the valve is moved to application position. Our yard masters and shippers are not sufficiently mechanically minded, however, to look at a car and say, 'Here is one that will have to be placed in the forward end of the train as the valve is sluggish in operation and it is necessary for an overcharge to take place in the brake-pipe before application in order to keep the valve from going into emergency.' I do not blame the enginemen for resorting to somewhat unethical means in trying to prevent emergency for there is a lot of satisfaction in doing a job well, and a dynamiter in a train is certainly an annoyance. It is a mistake, however, for these men to fix in mind the thought that the brake-pipe should be overcharged before making a service reduction with a freight train. . . . When we overcharge the brake-pipe, naturally we also overcharge the auxiliary and emergency reservoirs, and upon release of the brakes after an overcharge, the overcharge from the emergency reservoir builds up the auxiliary reservoir beyond the brake pipe and in turn finds its way into the brake cylinder.

"In former days, we were told to make a kick-off in order to get rid of the overcharge. With the Type-K triple this is fairly successful. However, with the Type-AB brake, this feature is omitted, and I know of only two ways to get rid of an overcharge on the AB. The first is to make several reductions and releases with the automatic brake valve. Just how successful you will be in doing this depends entirely upon the amount of overcharge and the length of the train. The second and sure way of getting rid of the overcharge is to bleed the car.

Further discussion of ways and means to avoid undesired emergency brake action developed a consensus in favor of starting brake applications sooner and making them lighter instead of throwing the brake valve handle quickly to service position and making a heavy reduction of 10 to 12 lb. to secure the desired reduction in train speed. Experience seems to show that enginemen who have the least trouble with unde-

sired emergency anticipate their braking requirements so that the first application may be a light reduction of possibly 6 lb. in brake pipe pressure, followed by additional 2-lb. or 3-lb. reductions as required.

Undesired emergency brake action is sometimes caused by excessive brakepipe leakage when trains are negotiating a curve or crossover and the loss of air at couplings combined with a service reduction brings the rate of fall of brake pipe pressure within the emergency zone. In the main, however, dynamiting is due to stuck valves, or valves with restricted service ports, of the older K type and can be practically eliminated by better air-brake maintenance practices in accordance with the more rigid test code now in effect. Owing largely to war conditions, only about 50 per cent of present freight cars are equipped with AB brakes and, since the designed capacity of Type K brakes is exceeded in modern long trains, this equipment must be maintained to somewhat higher standards if it is to function successfully in conjunction with the improved standard AB brake.

### **How High A Price Can We Afford to Pay?**

Recently a new type of steam locomotive was turned out of a builder's plant with appropriate ceremonies at which a number of newspaper men were present and when the party was over and everybody went home one of these newsmen, a columnist for a suburban newspaper, took the locomotive as the subject for his column the following day. He made an honest appraisal of a number of things, admitted that he knew nothing about locomotives except that as a small boy he was always fascinated when he saw them come roaring down the track and then ventured the personal opinion that he hoped some people were wrong when they predicted the untimely end of the steam locomotive. He liked the looks of an electric or a Diesel locomotive, he said, but they didn't cause his blood to run any faster when he saw them coming. He also knew that among railroad men there was considerable controversy as to which type was the best. He had, he said, been taught, as a boy, that it was next to impossible for people to make a living by taking in each other's washing but he was suspicious that among the major reasons why many railroads were deeply interested in perpetuating steam as a form of motive power was because the railroads made a pretty good living hauling each other's coal around. When it is considered that about one-quarter of the bituminous coal mined is used by the railroads it certainly is not difficult to understand that the railroads and the mining industry have one or two interests in common.

This newsmen touched upon a very important factor in this matter of the development of motive power for the future. If the railroads, the coal industry or the builders, individually or collectively, are going to ap-

proach the matter of research, so to speak, in the subject of the steam locomotive primarily on the ground that for individual interests a way must be found to keep it in existence they are approaching the problem on an economically unsound basis.

The railroad executive of the future is going to be faced with keen competition in the transportation field and if he is an intelligent railroad man he will know his job so well that he will be interested only in that form of motive power that will do the job at hand most efficiently and economically. It will make little difference to him whether his trains are hauled by electric, Diesel, steam turbine, gas turbine or reciprocating steam locomotives. The chances are that on most large roads at least all of these types will be doing the work of the future. But the important thing that must be kept in mind is that the final selection of motive power is as much a matter of economics as it is of engineering factors. If it isn't sound economically it doesn't make much difference how well it runs.

This brings us to the point we want to make. We have heard a lot of discussion about thermal efficiency and over-all efficiency and we know that inherently the Diesel-electric locomotive has a higher over-all thermal efficiency than a steam locomotive. But, in order to gain that efficiency it costs more to build and to operate, horsepower for horsepower and mile for mile. Almost every effort that is being made today to improve the efficiency of the steam locomotive is along lines that will increase its first cost. The cost of a 5,500-hp. steam freight locomotive has, several times in individual cases, passed the quarter-of-a-million dollar mark and, as for the turbine types, we do not yet know what their cost will be to the ultimate user. If, in order to develop a steam locomotive approaching the Diesel in efficiency it is going to be necessary to increase its first cost to a point where it practically equals the first cost of a Diesel it will have given up one of its major advantages over the Diesel. If a complexity of expensive-to-maintain parts becomes necessary in order to approach the Diesel's availability the effect upon total operating cost may be such as to wipe out another advantage.

This problem is too broad in scope to encompass within a single discussion but it may be well to keep the above points in mind in attempting to establish our future objectives. The reciprocating steam locomotive has a fine record so far in the matter of low operating cost and its first cost is moderate—we are speaking mainly of modern units built within the past 10 years. Given an even break by the operating department its availability record is far better than the average person thinks. Its real weaknesses lie almost entirely within the boiler—high maintenance costs, water troubles, fire-cleaning delays at terminals. There is hope that the efforts of those groups who are studying this problem may be so concentrated on the problem of a better boiler that the railroads may ultimately have available an ultra-modern reciprocating locomotive that still represents real economy in operation.



# THE READER'S PAGE

## The L. M. S. Turbine Locomotive

TO THE EDITOR:

The authors of the article describing the Pennsylvania's new turbine-driven locomotive in the *Railway Mechanical Engineer* for March conclude with a reference to locomotive practice on the London, Midland & Scottish Railway. The reader is left with the impression that the turbo-locomotive of that railway suffers by comparison with the reciprocating engines used in the same service because the latter are high-powered compounds, super-efficient, yet strangely unreliable. One can only wonder from what source the authors' information was obtained.

It may be stated quite positively that the L.M.S. possesses *no* compound locomotives comparable in power to its turbo-locomotive No. 6202, which is the heaviest 4-6-2 type in Great Britain. All of the Pacific type reciprocating locomotives owned by this railway have four single-expansion cylinders. The heavy 4-6-0 type locomotives, also used extensively on main line passenger trains, are three-cylinder simples. The only compound locomotives now running on the L.M.S. are small three-cylinder engines of the 4-4-0 type, built during the regime of the late Sir Henry Fowler and since relegated principally to secondary duties.

As to the performance of the L.M.S. turbo-locomotive, it has now run more than 250,000 miles in express passenger service, largely on London-Liverpool trains, and may be regarded as quite reliable mechanically. In coal and water consumption per drawbar horsepower hour, it does not differ noticeably from the reciprocating engines employed on similar work. Speaking before the Institution of Mechanical Engineers in 1941 and again in 1944, Sir William Stanier, who was responsible for the design, construction and operation of this locomotive, stated quite plainly that it showed little increase in thermal efficiency as compared with a reciprocating locomotive, because of the absence of a condenser. He also observed that the variable demand upon the locomotive for power

prevented the attainment of maximum turbine efficiency, confirming an opinion long held and often expressed by others.

WM. T. HOECKER.

## Curtis Turbine Defined

TO THE EDITOR:

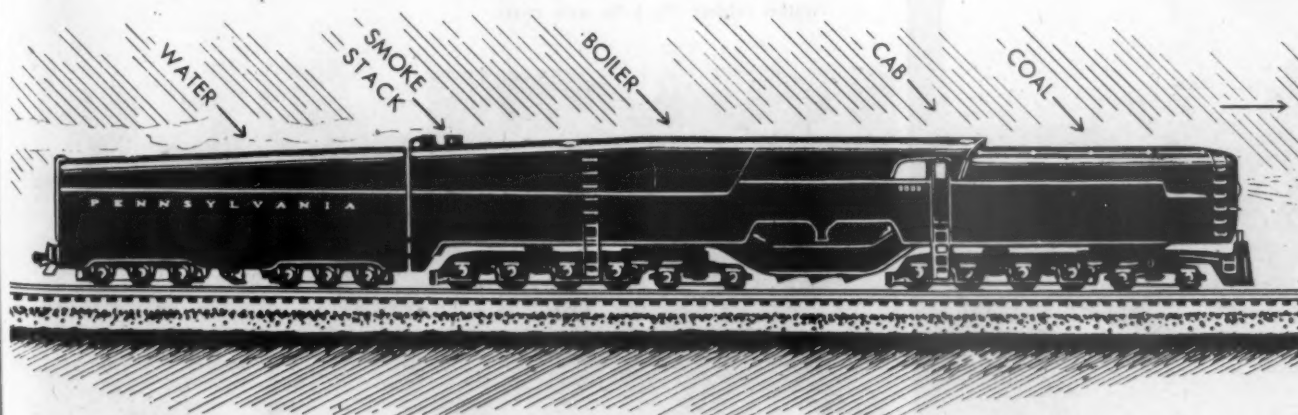
On page 99 of the March *Railway Mechanical Engineer* in an article on the steam turbine locomotive built for the Pennsylvania you state that "the forward turbine is of the impulse type and consists of a Curtis stage followed by five full admission Rateau stages."

This mode of describing the turbine is sometimes used, but it is not correct. The fact is that my type of turbine, used by Westinghouse in the above locomotive, is exactly like the one built by the General Electric Company from the beginning, involving the use of a two-row stage with a series of single-row stages. It was described and shown in my patent 566,969 (September 1, 1896) and is covered by the claims therein. This patent was broadly supported by the Circuit Court of Appeals in 1914 and in Judge Buffington's opinion the conclusion was reached that the work done by Rateau was not of practical value, cut no figure in the art, and was not an anticipation of the Curtis patent.

The early turbines designed by William L. R. Emmet and myself involved this combination and the marine turbines designed and built by me at the same time also involved the combination, as have all these built by me at the same time also involved the combination, as have all these built since that time by the General Electric Company and by our licensee, both in the land and marine fields.

CHAS. G. CURTIS, PRESIDENT,  
International Curtis Marine Turbine Company

\* \* \*



The Pennsylvania designs another steam-turbine locomotive

Known as the Triplex, Class S-2, with coal bunker ahead of the boiler on the same cast-steel frame, the locomotive will be driven by two geared steam turbines, one on each of two swiveling trucks with four driving axles each. The turbines will develop 9,000 hp. Water from the tender will replace coal, as it is burned to maintain constant adhesion. Water capacity, 21,000 gals.; coal,  $32\frac{1}{2}$  tons; total wheel base,  $122\frac{1}{2}$  ft.



# With the Car Foremen and Inspectors

## Assembling Narrow-Gauge Cars at Hawaii

Narrow gauge railway cars, used to carry supplies at an Hawaiian Island naval base, are being assembled at the rate of 8 to 10 cars a day by a Navy Seabee battalion which operates an effective assembly line to handle the job.

Except for size, the 30-ton capacity steel cars, 38 ft. long by 7 ft. wide, involve the same general construction as standard cars used in the United States.

To conserve cargo space the cars are shipped to Hawaii dismantled. The frames arrive with flooring already in place, but all draft-gear assemblies, stake pockets, sides

and other parts have to be installed by the Seabee assembly crew, only a few of whom have had prior railroad experience.

Lack of proper tools and facilities for the job necessitates unusual methods of procedure. Commander Eugene C. Lang, Civil Engineer Corps, U. S. N. R., of Geneva Road, St. Charles, Ill., officer in charge of the battalion, whose pre-war experience as a general consulting engineer in Chicago included some more or less extensive observation of American railway car-shop operations, has successfully developed and applied the idea of turning the beds of the cars upside down on the trucks, installing the necessary parts in this more accessible position, then turning the beds over to their proper position to complete the operation.

First, 1,000 ft. of railroad track was constructed, with enough space to accommodate 15 cars on the assembly line. Then a completely assembled car was made up and set aside to serve as a model. This model makes it unnecessary for the men to refer frequently to blueprints, and has the added advantage of showing clearly how and where each part should be installed.

The assembly line, in which seven major operations are carried out, assures an orderly procedure and conserves both time and labor in performing the various assembly operations. The line is designed to employ 56 men, but this number may be varied without slowing down production to any appreciable degree.

In the first operation, the trucks are serviced, journal bearings and wedges being applied while the trucks are supported in a slightly elevated position with the journal boxes resting on 10-in. by 12-in. timbers, as shown in one of the illustrations. The trucks are then lifted off the timbers and moved into position on the assembly-line track.

In the next operation, a Northwest gasoline-operated



Above left: Assembling narrow-gage freight car trucks at Hawaii—Left: Placing car bed upside down on timbers laid over truck bolsters—Below: Looking down the assembly line—Right: After parts are temporarily secured with bolts, riveters replace the bolts with rivets



crawler-type crane lifts a car bed from the stack beside the track and lowers it, upside down, to rest on two timbers laid on top of the truck bolsters.

Draw bars, complete with draft gear, and coupling bars are installed, after which the car is pushed along the track by a small bulldozer. Supply men unpack and sort bolts, nuts and parts, and place the required items on the inverted car bed, ready for the crews to install.

The main assembly is done in the third operation,



Above: A Northwest crawler crane is used to place bed on long timbers—Below: Turning the bed right side up



Mounting the car bed in position on the trucks preparatory to final painting and testing

where a crew installs the brake mechanism, grab irons, stake pockets and sill steps before the car is moved up to the riveting crew. All the required riveting is completed at the fourth position, with the aid of air-guns and an oil burning unit heater, installed on the site for heating rivets in quantity.

The fifth operation is the final assembly, where the car bed is lifted by the crane, turned right side up, and lowered into place on the king pins of the trucks. Brake hand wheels, side boards and air hose are then installed. The necessary stenciling and painting is done at the sixth position and the car is pushed down the tracks to the seventh position for final testing.

Although unorthodox, this method of assembling cars has proved satisfactory and efficient. With few minor changes, both flat cars and gondola cars have been assembled, and the crew is now preparing to assemble box cars by adding another operation to their assembly line.

## A Mast Crane With 38 Ft. Swing

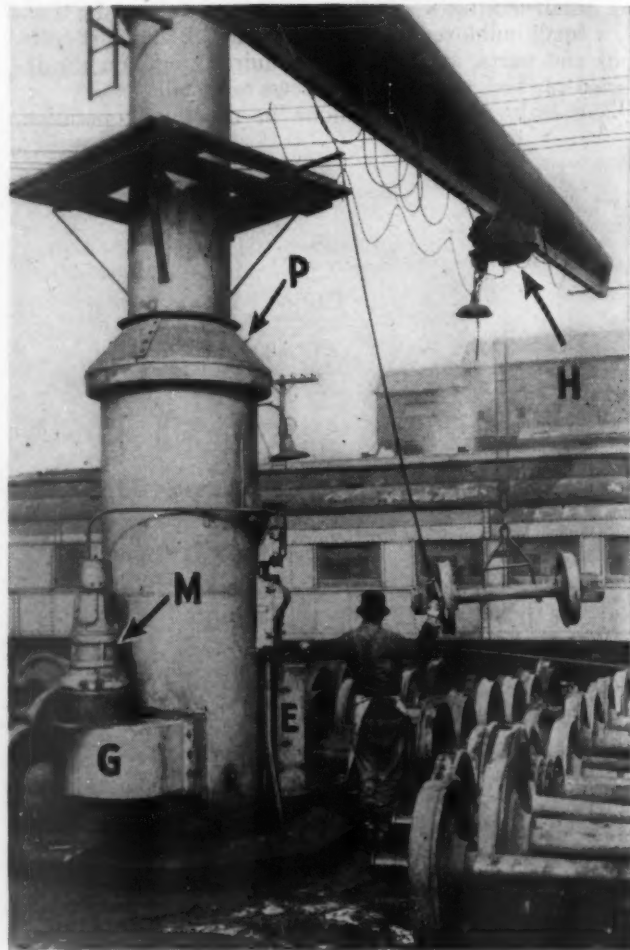
The work of handling car wheels and other heavy materials at the Western Avenue coach yard of the Chicago, Milwaukee, St. Paul & Pacific, at Chicago, is greatly expedited by means of the large mast crane shown in the illustrations. This crane incorporates welded tubular steel construction throughout, with a 40-ft. tapered boom which swings through a full 360 deg. in either direction at an elevation of 20 ft. above ground level and has a lifting capacity of two tons by means of a Harnischfeger traveling electric hoist. Because of the construction of the crane, it is sometimes referred to locally as "Big Bertha." It is unusually rigid and easy to operate and, in over two years of service, has required practically no maintenance.

In operation, this crane saves a large amount of time and labor in handling car wheels, couplers, oil boxes, elliptic springs, pedestal castings and heavy car materials to and from the wheel car which makes regular trips between Western Avenue and the Milwaukee shops. The crane is designed with a boom of maximum length to clear the Western Avenue shop buildings and extend out over the track on either side of the car-wheel shop. The wheel car can thus be loaded or unloaded while on either track and, in addition, car wheels can be readily moved from any point on the storage tracks to the shop delivery track, or vice versa, without manual handling.

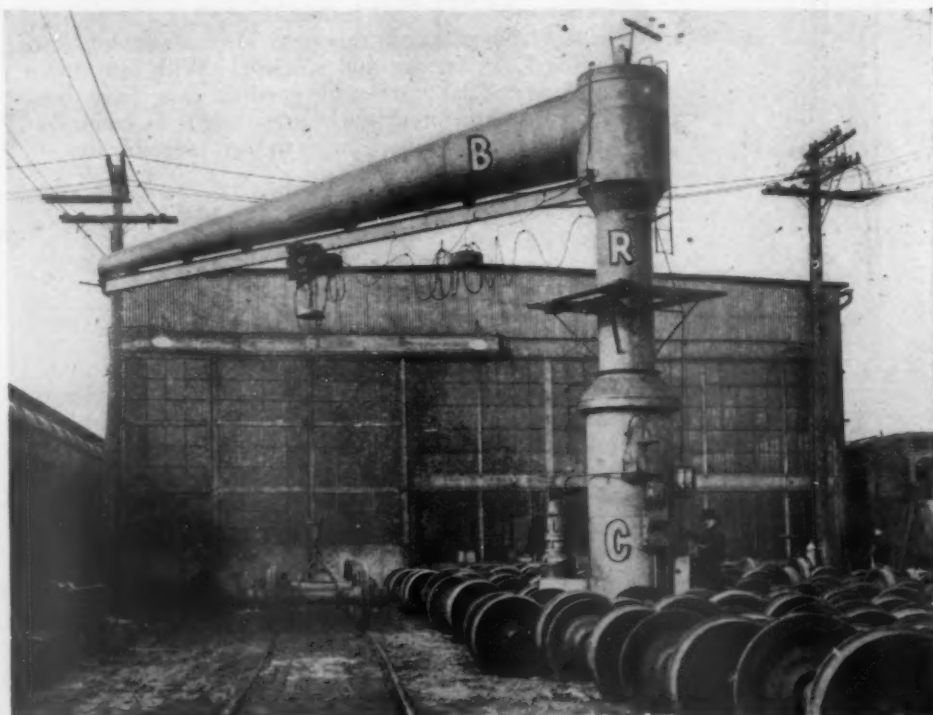
Some idea of what this means in time and labor saving may be obtained by comparing present with former practice when a stationary air hoist and portable wooden platform had to be used in loading and unloading car wheels. Moreover, when a pair of wheels was needed from the middle of one of the storage tracks, all wheels ahead of it had to be moved individually and turned by means of a wheel stick at the transfer track before that particular pair of wheels could be released and run into the wheel shop. Obviously all the wheels moved had to be manually rehandled and rolled back to their original positions so as not to interfere with the next movement on the shop track.

Referring to the illustrations, the general construction of this mast crane will be apparent. It consists of a large vertical welded cylinder *C* firmly set in a concrete foundation, revolving mast *R* and boom *B*. Details shown in the other view include the Harnischfeger 2-ton hoist *H*; taper cover plate *P* which protects the upper roller bearing, electric driving motor *M*, gear box *G* which covers the speed-reducing gears, electric control box *E* and handle (in the operator's left hand) which governs the movement of the boom; also a swinging cable and push-button controller (in the operator's right hand) which controls horizontal traverse of the electric hoist and vertical movement of the crane hook. An electric light fixture, suspended from the hoist, gives good illumination directly over the crane hook which can thus be applied or released without difficulty on the darkest days or nights. Incidentally, this is an important safety feature.

Cylinder *C* is made of three sections of  $\frac{3}{4}$ -in. steel plate, rolled and welded to form a cylinder 3 ft. 9½ in. in diameter by 15 ft. 6 in. long. The bottom section,



The boom-revolving motor and electric controls of the C. M. St. P. & P. mast crane



A mast crane and 2-ton electric traveling hoist installed at the Western avenue coach yard of the C. M. St. P. & P. at Chicago



5 ft. 6 in. long, is reinforced with five circumferential ribs for stiffening purposes and to hold it firmly in the solid concrete foundation into which it is imbedded to a depth of 5 ft. The balance of the mast extends vertically 10 ft. above the ground and serves as a housing and support for the mast.

Mast *M*, also made of  $\frac{3}{4}$ -in. steel, is rolled and welded to form a 2-ft. 6-in. cylinder approximately 16 ft. long which extends down into cylinder *C* about 7 ft. and is closed at the lower end with a welded steel plate and bushing assembly, designed to house a Timken car roller-bearing and journal-support unit, suitably mounted in a vertical position in the base of cylinder *C* at an elevation slightly above ground level. This roller bearing not only positions the lower end of mast *R*, without restricting rotation, but supports most of its weight on the taper rollers. The bushing referred to is connected to a large spur gear which turns the mast in either direction by means of power supplied from the reversing electric motor *M*.

The upper support bearing for mast *R* consists of a series of fixed center rollers mounted around the exterior of the mast and having as an outer bearing a substantial steel ring welded to the upper end of cylinder *C*. This entire bearing, which takes side thrust of the mast in any direction, is protected against the entrance of dirt or water by means of taper cover plate *P*. For purposes of lubrication, the entire space between mast *R* and cylinder *C* is filled with about 400 gals. of second-hand car oil which supplies an oil bath for both roller-bearing units. The oil level is maintained just above the upper bearing under cover plate *P* and this means that approximately a 10-ft. head of oil exerts a lifting effect on the lower end of the mast, thus relieving the lower taper roller bearing of about one-third of the 16,000 lb. weight which it would have to carry otherwise.

One of the most interesting features of this crane is the boom which is made of  $\frac{1}{4}$ -in. open-hearth steel in six sections, cut, rolled and welded together to form a conical tube, 14 in. in diameter at the smaller end and about 48 in. in diameter at the larger end where it is welded to a 5-ft. vertical steel cap forming the top of mast *M*. As a matter of fact the actual length of the boom is 38 ft. from the small end to the center line of the mast. The top of the mast cap is 4 ft. in diameter, so the total length of the boom may be called 40 ft.

The boom is welded to the mast cap at an angle so that the lower edge of the boom is accurately horizontal. Supported 3-in. below it by welded connections from seven points on the boom is a 10-in. 25-lb. steel I-beam which carries the travelling hoist, with rollers bearing on the two lower flanges. A substantial stop on the outer end of the I-beam limits the travel of the hoist which is traversed horizontally and the hook raised or lowered by remote push-button control near the base of the crane mast as explained.

Ring-type electrical connections are made to the top of the mast, as shown in one of the illustrations, and both views show the steel wire and sliding clip supports for the insulated wires which supply electric current to the hoist motor and to the light fixture attached to the hoist. Other electric connections to the motor and controller which revolve the boom are illustrated. The main mast carries a small scaffold and steel ladder welded to the cap for the convenience of electricians who go to the top for inspection of electrical connections.

The boom of this mast crane swings very easily, smoothly and quietly by operation of the controller handle which has four positions or speeds in either direction. A brake element, built into the base of the main

mast, is not normally used as the boom can be easily spotted wherever desired by means of the controller handle, alone. The electric hoist also moves quietly and with minimum friction on its I-beam support and is designed to lift up to two tons.

## Air Brake

### Questions and Answers

#### HSC High-Speed Brake Equipment for Passenger Cars and A and B Diesel Locomotive Units

269—(Continued)—*Functioning of parts of locomotive equipment during initial charging operation.* A.—With the handle of the MS-40 brake valve in release position, the control pipe 11 is open to the atmosphere through brake valve cavity *B*, past exhaust valve to the exhaust *Ex*. Therefore, chamber *B* of the master controller, which is connected to the MS-40 brake valve by the control pipe, is open to the atmosphere. Spring 40 holds the shaft 32 in release position, where its contact levers hold the application and release contacts open. The application wire and release wire are de-energized. With the application and release circuits open at the master controller on the A locomotive unit, the application and release magnets of the 21-B magnets on the locomotive units and cars are de-energized.

At the 21-B magnet, auxiliary reservoir air unseats by-pass valve and flows to passage 6a, charging the chamber beneath the application magnet valve. The latter is held seated by air pressure and its spring. The release magnet valve is held unseated by its spring, thus connecting passages 4a and *x*, opening the air pipe to the exhaust.

At the D-22-ER control valve, air from the brake pipe flows through the branch pipe combined dirt collector and cut-out cock, through the filter 12 and to chambers *A* and *B* on the faces of service and emergency pistons, moving them to release position. With the service piston in charging position the piston head uncovers charging choke 83 and the charging ports *x* in the piston bushing. Brake pipe air in chamber *A* charges the auxiliary reservoir through (a) choke 85 to service slide valve chamber *C*, thence through passage 5g, release slide valve chamber *D* and passage 5 to the auxiliary reservoir; (b) charging ports *X*, passages 5f, choke 81, past check valve 73, passage 5g, release slide valve chamber *D* and passage 5 to the auxiliary reservoir, check valve 73 permits charging in this direction but is seated by spring 89 to prevent back flow from the auxiliary reservoir when the latter pressure in passage 5g is higher than brake pipe pressure in passage 5f. The slide valve chamber *C* and the release slide valve chamber *D* are connected by passage 5g so that the auxiliary reservoir pressure is the same in both chambers at all times. Auxiliary reservoir pressure in chamber *C* is also connected to the spring side (chamber *K*) of the release piston, through port *a* in service slide valve and passage a1. With the air pressure acting on the release piston balanced, spring 116 moves the piston and attached slide valve to release position, where cavity *Q* in the slide valve connects the displacement reservoir passage 3b to exhaust passage 10. The emergency reservoir is charged simultaneously with the auxiliary reservoir from the release slide valve chamber *D*, through passage 2c at the right end of the release slide valve, passage 2f, past ball check valve 195 and flat check valve 73c, passages 2k and 2a and pipe 2 to the emergency reservoir. Spring 89c is overcome and check valves 195 and 73c are unseated, permitting this charging flow as

long as auxiliary reservoir pressure is higher than emergency reservoir pressure, but when the emergency reservoir pressure is higher it seats the check valves and prevents back flow from the emergency to the auxiliary reservoir. In the emergency portion of the D-22-ER control valve the brake pipe air in chamber *B* on the face of the emergency piston flows through the charging choke to chamber *E* on the slide valve side of the piston and through the passage 4 to the quick-action chamber. With the pressures thus equalized on both sides of the piston it remains in release position.

At the FS-1864 or F-1864 relay valve on locomotive units, pipe 16 is open to control valve passages 16, 16c and 16d, past double check valves 263 and 263s, passage 8a, cavity *n* in slide valve and passage 8 to the straight air pipe, which is open to the 21B magnet valve exhaust. This connects diaphragm chambers *P*, *N*, *K* and *A* of the relay valve through passages 19, 18, 17 and 16a to the magnet portion. With the *M*, *L* and *H* magnets de-energized, passage 19 is connected past the upper magnet valve 161b and choke 138 to passage 15; and passages 18 and 17 past lower magnet valves 161 and 161a, and chokes 140 and 142 to passage 15. Passage 15 is connected past unseated supply valve 92 and passage 16c to passage 16. As passage 16 is connected to the 21-B magnet valve exhaust, the diaphragm cavities *P*, *N*, *K* and *A* are exhausted and the piston spring holds the diaphragm assembly released. All pressure is thus released from lever 43 which floats freely, permitting the exhaust piston and its valve to remain open, releasing the air from chamber *F* and connected brake cylinders to exhaust *Ex*.

At the FS-1864 relay valve on the A unit, chamber *A* of the switch piston is open to atmosphere. Spring 9 releases collar 6 which disengages finger 20 from contacts 28 and 28a, thus opening the battery circuit to the speed governor relay cabinet.

## Cleaning and Testing Pistons of AB Brakes

A combination cleaning, spring-testing and gasket-lubrication table for the reconditioning of AB brake pistons which was designed by the shop air-brake foreman has been installed at the Reading freight-car shop at Reading, Pa. The tables makes possible the centering of cleaning, testing and other operations in one location which is close to the working tracks where cars requiring attention to the AB brakes are undergoing repairs.

In the course of overhauling these brake parts the springs are first thoroughly cleaned, all rust spots are removed, and they are given a bath in japan drier. After being dipped in the drier they are hung on a railing to dry. The japan drier is used as a rust preventative and gives the surface of the springs a glazed appearance.

Near the spring cleaner is an arrangement for cleaning swab lubricators. A rack on the lid of the dipping tank, in which these parts are immersed in a special oil, holds the swab lubricators. When the lid is lowered the parts are covered by oil, when the lid is in the raised position the rack holds them above the oil level while excess oil drains back into the dipping tank.

A seal-ring gauge on the edge of the table is used to check all seal rings for correct size and contour.

After the cleaning and individual testing operations the pistons are reassembled on unit test racks where they are checked for proper movement of the pistons and for packing-cup leakage. The photograph shows these test racks, one in the open position and the other with a piston assembly mounted for test. Also shown in the photograph are three of the special metal carriers which are bolted fast to the non-pressure head and serve as a protection to those parts when they are being moved to cars for application.



Cleaning, overhauling and testing of AB brake-cylinder pistons take place at this compactly arranged working location in the Reading freight-car shop at Reading, Pa.



## IN THE BACK SHOP AND ENGINEHOUSE

# Selecting Carbides for Milling

**W**HEN starting a new milling operation with carbides—or when changing from high speed steel to carbide tipped cutters—an inevitable problem is the selection of the proper grade of carbide from among the many available. Increased knowledge as to the other factors contributing to good results, however, has so simplified grade selection over what it was a few years ago that today, a total of five “grades” of carbide as produced by Carboloy suffice to give optimum performance and cutter life over virtually the entire range of milling jobs. This holds true, of course, only if the basic requirements of good carbide milling practice are observed.

### Grinding and Cutter Design Are Important

Cutter sharpening is one of the factors which can make or break any carbide milling application. In general, carbide removal per wheel pass should not exceed 0.0004-in. for rough grinding; 0.00015-in. for finish grinding. Enough carbide must be removed from each worn cutter tip to get down to good solid metal again, but any attempt to remove too much carbide at a single pass of the wheel may result in heat checks which will ruin even the best grades of carbide. Examination of the ground surfaces through a magnifying glass of 20 or more magnifications will usually show how much carbide metal should be removed. If insufficient stock has been removed, fine, hair-like lines will appear on the carbide's surface. These lines will cross the cutting edges at several points. Cutter life will be materially shortened if enough stock is not ground off since these hair-like lines afford excellent points for starting the breakdown of the cutting edge.

Perfect grinding practice, however, will not offset incorrect cutter design. For instance, double negative angles should be used in most cases when milling steels and tough, hard cast irons. Present indications are that cutters with 10 deg. negative axial rake and 10 deg. negative radial rake will give best results when milling the harder steels; whereas 5 deg. positive radial rake angles can be used for soft steels. Furthermore, enough chip room should be provided in the cutter so the chip will not heat up and get sticky, a condition which may result in the chip's being pulled through a second time to the detriment of the cutting edge.

Setup conditions of the specific job—particularly as they affect rake angles—should always be taken into consideration when designing a carbide cutter. Since negative rake angles are used to keep the chip load away from the cutting edge and the nose, the axial rake angle should be large enough so that the impact load is taken at a distance equal to the depth of cut away from the cutter face. The impact load should also be taken at a distance from the peripheral cutting edge on the tooth face equal to the chip thickness.

Since it is possible to put negative angles on the cutter and yet—due to setup conditions—have the load come on

**By Fred W. Lucht\***

the cutting edge or nose as the tooth enters the cut, it is good practice to check the cutter setup and make sure that the actual effective angle between cutter and work is in line with the desired rake angles.

### Feeds and Speeds

Feed per tooth should be high enough to avoid concentration of chip load near the cutting edge. Optimum feed per tooth for milling steels has been found to be between 0.008 and 0.012-in. Best cutting life is usually obtained when the cutting edge enters the cut with a thick chip. Chip thickness is at its maximum and equal to feed per tooth when the edge of the work where the cutting edge enters it is at the cutter center line parallel with the direction of feed. If the work is moved in either direction at right angles to the direction of feed, chip thickness will gradually decrease.

Too high speed increases carbide wear; whereas speeds which are too low cause a built-up edge to form, resulting in poorer finish and reduced cutter life. A steel having a Brinnell hardness of 110 seems to be milled best at about 750 surface ft. per min. Heat treated alloy steels with hardness as high as 400 Brinnell will mill best at about 360 surface ft. per min. Varying speed with hardness in this manner has been found to give the longest life of carbide cutters.

The use of flywheels on milling machines gives two definite advantages, particularly when milling at high speeds. A flywheel damps out chatter and high frequency vibrations in the cutter drive resulting from changes in load as the individual cutter teeth enter and leave the cut. This factor is doubly important with carbides since vibration and chatter are more injurious to carbides than they are to the softer cutting tool materials.

The second advantage of flywheels is that they help maintain a more constant cutting speed through the entire length of cut, carrying the machine through intermittently heavy cuts without stalling the motor or slowing it down below the cutting speed which is desirable with carbides.

As for the size of flywheel, a good rule-of-thumb is to make the fly-wheel bigger than the cutter and also larger than the largest gear on the main spindle. Putting a lot of beef into the cutter body also helps smooth out the cutting action.

### The Selection of Grades

Any chart of the nature of the one shown—in which major classifications of milling jobs as they affect grade selection are listed—has a natural tendency towards oversimplification. However, the user cannot go far wrong by starting with the suggested grade—providing other re-

\* Development Engineer, Carboloy Company, Inc., Detroit, Mich.



quirements have been met—then changing to another grade if the job gives indications of requiring greater emphasis on some other carbide “quality.”

### The Milling of Steel, Cast and Malleable Irons

Steel milling is divided into three classifications based on a shifting of the relative importance in qualities required in the carbide. All carbide qualities given here are relative—as between grades of carbides. For instance, all grades of carbides are more wear and abrasion resistant than are other commonly employed cutting-tool materials. However, simple tungsten carbides are more

characteristics. Steel-cutting grades of carbides frequently give better results on malleables than do the straight iron-cutting grades. There is quite a similarity here to the recommendations for finish milling steels.

In this group are included those irons with hard spots or hard sections, inasmuch as such sections frequently control the selection of the carbide by making toughness rather than abrasion resistance the limiting factor as regards tool life.

For milling the simpler cast and malleable irons, abrasion resistance is usually the limiting factor as to tool life. Straight tungsten carbides are usually considered best for this work. Where work sections are particularly rough, the tougher grades of straight tungsten carbides provide somewhat greater life. On smoother castings and for taking finishing cuts, the more abrasion-resistant grades of straight tungsten carbides will usually give longer tool life and a flatter finish.

### Non-Ferrous Alloys

For most aluminum milling, straight tungsten carbides usually work out best. These grades provide a high degree of resistance to the abrasion caused by the aluminum oxides and other abrasive materials included in many aluminum alloys.

In some aluminum milling—such as form milling—formation of a built-up edge on the tool may cause trouble. The addition of a slight amount of tantalum to the carbide helps to resist the build-up.

On other non-ferrous metals and non-metallic materials a straight tungsten carbide usually gives best results inasmuch as in most of these materials the most important carbide qualities called for are ability to resist abrasion and wear and ability to take and maintain a keen cutting edge.

Chart for Selecting the Correct Grades of Carbide for Milling Operations

Job	Job Characteristics	Required qualities in carbides	Suggested carbides*
<b>STEELS</b>			
Rough milling	All	Cratering resistance; toughness; wear resistance; edge strength	Tungsten-titanium-tantalum carbide, Grade 78B
	Heavier feeds or cuts	Wear resistance; cratering resistance; toughness; edge strength	Tungsten-titanium-tantalum carbide, Grade No. 78; Harder or 78B tougher
Finish milling	Lighter feeds or cuts	Same as above; even more abrasion resistance and edge strength	Straight tungsten carbide, Grade No. 883
<b>PLAIN CAST AND MALLEABLE IRONS</b>			
Rough and finish	Rough castings	Toughness; wear resistance; Cratering resistance	Straight tungsten carbide, Grade No. 44A.
milling	Smoother castings; finishing cuts, etc.	Abrasion resistance; toughness; cratering resistance	Straight tungsten carbide, Grade No. 883 (Greater abrasion resistance)
<b>STEEL TYPES OF CAST AND MALLEABLE IRONS OF IRONS WITH HARD SECTIONS</b>			
Rough and finish	All	Cratering resistance; abrasion resistance; toughness	Tungsten-titanium-tantalum Carbide, Grade No. 78 or 78B for those irons most nearly approaching steel in character. Straight tungsten carbide, Grade No. 883 when higher abrasion resistance is required.
<b>ALUMINUM ALLOYS</b>			
Rough and finish	General milling	Abrasion resistance; toughness; wear resistance; ability to take and retain a keen edge	Straight tungsten carbide, Grade No. 883
milling	Form milling	Same as above. Must also resist formation of a built-up edge	Tungsten-tantalum carbide, predominantly tungsten, Grade No. 907
<b>MAGNESIUM, ZINC ALLOYS, BRASS, BRONZE, PLASTICS, FIBER, ETC.</b>			
Milling	All	Abrasion resistance; wear resistance; toughness	Straight tungsten carbide, Grade No. 883

\* The grade numbers refer to products of the Carboloy Company, Inc.—Editor.

wear-resistant than are the tungsten-titanium-tantalum carbides; while these “triple” carbides, in general, are tougher than straight tungsten carbides.

In rough milling steels, where chip load is heavy, maximum cratering resistance (as provided by carbide grades of the 78B type) is usually of primary importance. Toughness, wear resistance, and edge strength under impact loading, in their order of relative importance, are also required characteristics of the carbide suitable for such work.

A straight tungsten carbide is suggested for finish milling if cuts or feeds have to be light, since under such conditions the cutting edge has to resist more abrasion than is encountered where heavier cuts or feeds are possible.

For heavier finishing cuts, the option of two grades are suggested. In general, if the job comes closer to rough milling, a grade equivalent to 78B will be more likely to produce best results.

Cast and malleable irons are divided into two groups since many present-day irons approach steel in machining

### Resistance Welding

[An understanding of fundamentals concerning oxyacetylene and electric-arc welding processes can be assumed to be general in railroad shops which have used both methods for many years. Resistance welding is less-commonly used in railroad shops. The following abstract from an article on basic definitions in welding technology prepared by C. H. Jennings, welding engineer, Westinghouse Research Laboratory, Westinghouse Electric & Manufacturing Company, makes clear the distinctions between various applications of the process.—EDITOR.]

Resistance welding covers a group of processes wherein

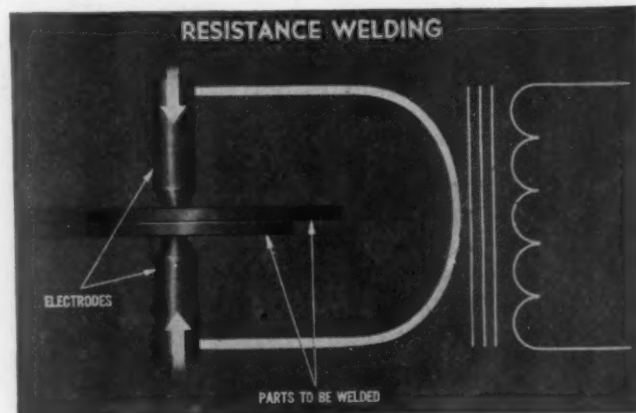


Fig. 1—The electrodes for resistance welding transmit current and apply pressure

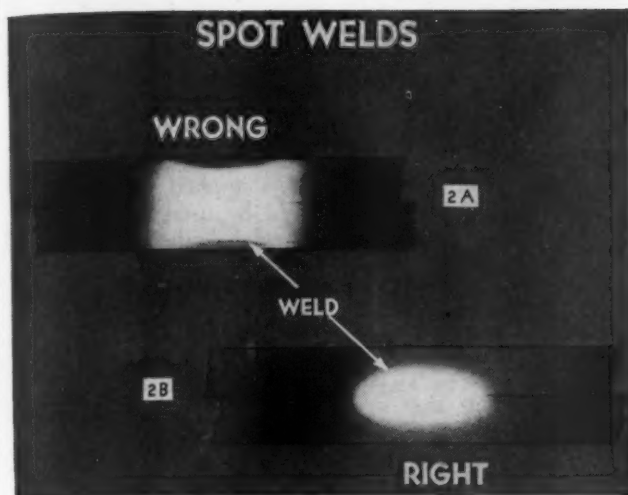


Fig. 2—Fusion of metals in resistance welding should not extend to the surface of the pieces being joined

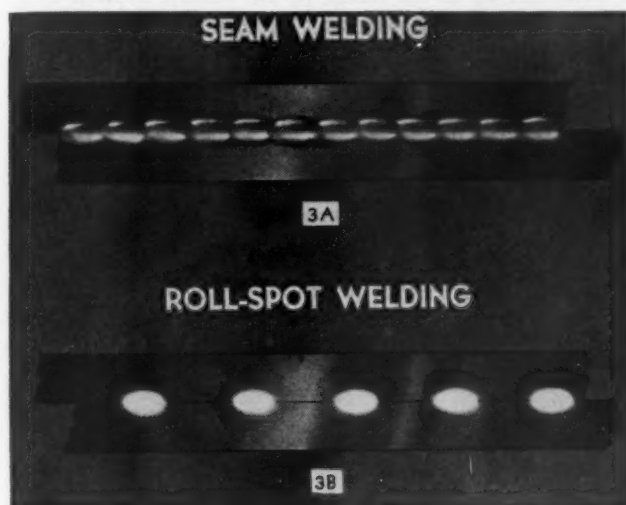


Fig. 3—Timing of current flow between electrodes gives desired weld spacings

the welding heat required to make the weld is produced from the resistance offered by the parts and contact surfaces to the passage of a heavy electric current. Pressure is used in combination with the heating to complete the weld. Types of resistance welding are spot welding, projection welding, seam welding, resistance butt welding and flash welding. Only the spot welding process will be described.

In spot welding, the pieces to be welded (two or more) are clamped between two copper or copper-alloy electrodes, Fig. 1, mounted in a suitable machine capable of applying pressure between the electrodes. These electrodes are used to conduct the welding current and to supply pressure to the parts. Usually they are water cooled to help prevent sticking, burning, and deformation under heat. The weld is made by passing a heavy current through the electrodes and work pieces. This heavy current is obtained by practically short circuiting the secondary of an extremely high-current welding transformer.

The resistance of the metal pieces and their contact surfaces to the heavy current passing through them causes intense heating. This heating, in combination with the applied pressure of the electrodes, produces fusion between the parts resulting in a circular weld known as a spot weld. The size and diameter of the spot weld will depend upon many factors such as type and thickness of

parts being welded, diameter and shape of electrodes, amount of pressure, amount of current and welding time. These factors will also affect the size of the fused nugget of the weld. In some cases fusion of the metals may extend to the outer surfaces, Fig. 2(a), while in other cases it may be confined to a narrow volume as shown in Fig. 2(b). In general a controlled nugget of the type shown in Fig. 2(b) is preferred, and on certain materials such as stainless steel and alclad aluminum it is essential if proper corrosion resistance is to be preserved.

Seam welding is a process similar to spot welding and varies in that rollers are used for electrodes. By properly timing the periods of current flow as the parts are passed between the roller electrodes a series of spot welds are made. If the spots overlap a continuous weld is made, Fig. 3(a). If the spots do not overlap and a space is left between welds, Fig. 3(b), the process is known as stitch or roll spot welding.

Projection welding is another variation of spot welding and consists of placing projections on one of the pieces

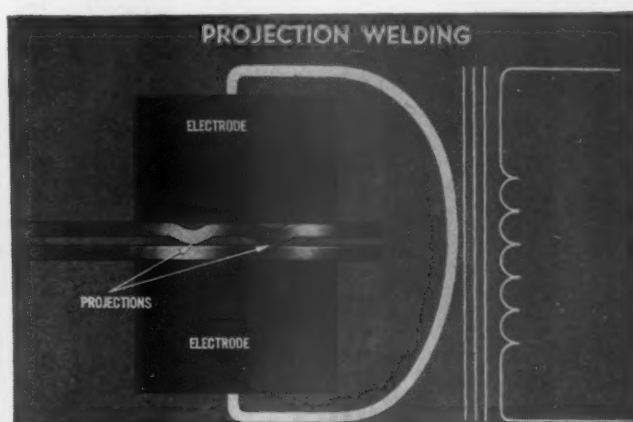


Fig. 4—Projection welding is particularly useful where the thickness of pieces being joined vary greatly

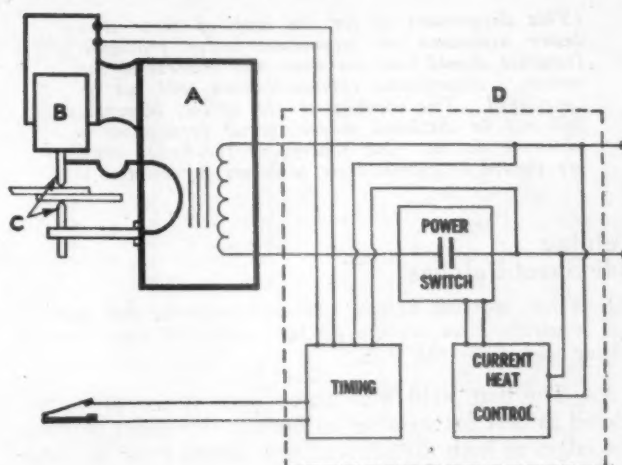


Fig. 5—Elements of a resistance spot welder

A—A heavy frame supporting an extremely high-current transformer.  
B—Pressure head for the electrodes.  
C—Electrodes, made from copper or copper alloys and usually water-cooled.  
D—Controls.

to be welded, Fig. 4, after which current is passed through the work pieces. Large electrodes are generally used in this process and the projection locates the points at which the welds are made. Projection welding is particularly adapted to the production of more than one weld at a time, and to the welding of two pieces varying greatly in thickness.



Resistance welding is a high-speed process and is particularly adapted to production work, especially to the quantity production of small parts. It is applicable for use on a great variety of materials both ferrous and non-ferrous, and although it is most commonly applied on parts  $\frac{1}{4}$  in. or less in thickness recent developments have extended the process to the welding of materials  $\frac{1}{2}$  in. thick and above.

The increased knowledge of the metallurgy of resistance welding combined with modern resistance-welding machines and control has vastly increased the application of this process. The principal elements of a modern resistance spot welder are shown in Fig. 5.

The problems of resistance-welding control may be divided broadly into three parts: start-and-stop control of the current to the welder, control of the amount of current that flows, and control of the welding time and electrode pressure sequence.

All three of these basic control problems are handled electronically which has resulted in giving resistance welding speed and exactitude and extended its application to practically every metal fabricating industry, both for sub-assembling and for final assemblies. So precise is the control by electronics that even materials such as aluminum, stainless steel, alloy steel, and magnesium, which was once considered non-weldable, are now welded on a mass-production basis. It is possible to weld two  $\frac{1}{8}$ -in. strips of stainless steel by shooting through them a current of approximately 15,000 amperes for a fifth of a second. Alloy steels can be welded, grain-refined, and tempered without removing the electrodes from the work.

## Locomotive Boiler Questions and Answers

By George M. Davies

*(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)*

### Welding Side-Sheet Patches

Q.—When applying firebox side-sheet patches, what type of weld is used? How are the patches secured in place for the welding operations?—M. F. K.

A.—The butt weld with a vee joint is generally considered as best for welding on firebox side-sheet patches. The edges of both the old and new sheets must be clean and beveled. The angle of bevel varies somewhat on various roads but the generally accepted practice is to use a 30-deg. angle on each sheet giving a 60-deg. included angle at the joint. The patch should be bolted so that a gap of  $\frac{1}{16}$  in. is left all around. This can be done by setting staybolts in every other staybolt hole around the perimeter of the patch, the staybolts acting as spacers so that the patch will lay flush with the side sheet. Common bolts are then applied in the remaining holes to hold the patch in place for welding. Straps can also be used, the straps being bolted both to the side sheet and the patch. The seam is tack welded at intervals of about 12 in. so that the patch cannot get out of line. The bolts or straps

are then removed. The first bead, or pressure bead, is made with  $\frac{1}{8}$ -in. diameter welding rods to insure penetration as the weld on the water side must be clean and flush with the sheets and have no gaps or mud catchers. The first bead is laid directly in the center of the seam. No attempt should be made to fill the gap with the first bead. After the first bead is applied,  $\frac{5}{32}$ -in. and  $\frac{3}{16}$ -in. diameter electrodes should be used to complete the weld, each layer of weld metal being thoroughly cleaned of all scale.

### Syphons Complete With Crown Sheet

Q.—Is it possible to obtain thermic syphons complete with the crown sheet?—R. E. F.

A.—Syphons are furnished with flanges of sufficient width and length so that when the syphons are applied they form the entire crown sheet. The front of the syphon flange is welded to the firebox tube sheet and the rear of the flange to the firebox door sheet. The firebox sides are extended up to the flange of the outside syphon and the longitudinal edges of the syphons are butt welded together to form the crown sheet.

### Gas Flow In Front Ends

Q.—Our Mikado-type locomotives are equipped with the Master Mechanic's front end. Would the elimination of the Master Mechanic's front end increase the flow of the gases to any appreciable extent?—M. E. F.

A.—The University of Illinois front-end tests showed that for a given steam rate and the velocity of discharge, i.e., with a given nozzle and pressure, a decrease in the resistance to the passage of gases resulted in a larger amount of air being moved with a reduced draft, and vice versa. The elimination of the Master Mechanic's front end from the smokebox improved the rate of gas flow a maximum of eight per cent over the performance of the same smokebox with it installed. In actual practice this improved rate of gas flow cannot be obtained as some form of front-end arrangement is required to present live cinders from going out of the stack.

## Tool Holders for Machining Locomotive Parts

Among the numerous shop-developed devices in use at the Finley shops of the Southern located in Birmingham, Ala., are tool holders designed especially for machining operations on locomotive parts. The two shown in the drawings and photographs are among the most useful. One of them, the double bar used on a slotter for machining the toes on crown brasses, is in almost constant use because of the volume of driving-box work in the shop; the other, used for truing and finishing eccentric crank arm pins, is mounted on the spindle of a standard drill press as work requirements dictate.

Crown brasses are held in position on the work table of the slotter by an air clamp which is of rugged construction and in which the brasses are mounted on end. The tool holder is designed so that both toes of a brass are machined with each stroke and, when the machining operation is complete, the toes have been finished with the correct radii and tapers by specially-ground tools.

The offset tool holder for finishing crank-arm pins fits over the end of the spindle on a standard drilling machine



A black and white photograph of a vertical industrial machine, possibly a drill press or lathe, with a workpiece being machined. A small, tangled wire is visible on the right side of the machine.

4- $\frac{5}{8}$ " x 1" Setscrews

4- $\frac{5}{8}$ " x 1" Setscrews

Note:  
Holes in bar to lighten it.

A dark, high-contrast black and white photograph of a large industrial machine, likely a lathe or mill. The machine is composed of various metal parts, including a large rotating workpiece at the bottom and a tool head or carriage above it. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the metallic textures and the complex geometry of the machinery. The overall mood is industrial and somewhat somber due to the low-key lighting.

[illegible]

Railway Mechanical Engineer  
APRIL, 1945

# Insuring Varnish Quality

**E**ACH filtration of contaminated insulating varnishes saves 25 cents to \$2.50 a gallon in material and labor costs and increases dry dielectric strength about 30 per cent; wet dielectric strength about 200 per cent. Such filtering can be satisfactorily accomplished with portable equipment. The time between filtering operations depends upon use in the tank and care taken in operation.

There are three mechanisms of contamination of the varnish. The contaminant may be washed from a piece

**By D. L. Gibson\***  
**and**  
**C. H. Braithwaite\***

**A report on tests made to determine effective and practical means of maintaining quality of insulating varnishes**

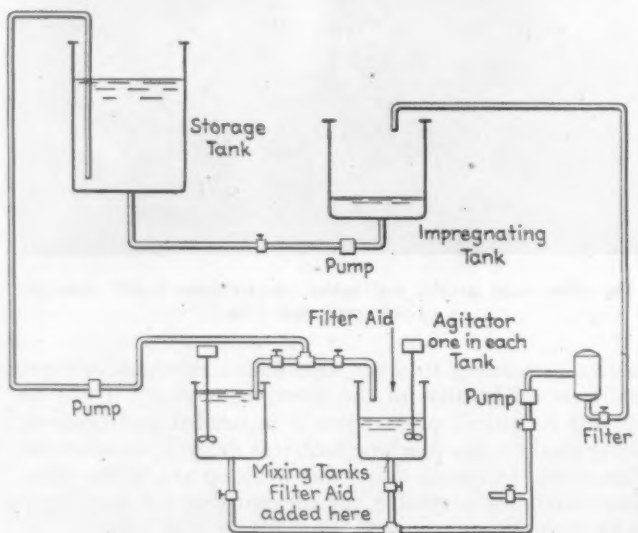


Fig. 1—Flow diagram for the reclamation of insulating varnishes through pressure filtration

of apparatus while it is immersed in the varnish tank. This means the suspension of particles of a particularly troublesome nature in the varnish. For example, when rehabilitated armatures are being processed, some of the dust and dirt accumulated in service is washed into the varnish tanks when the apparatus is immersed. Carbonaceous dust, metal chips of small diameter, small droplets of paint and other foreign material may enter the varnish when the tank lid is open.

Finally, material foreign to the varnish may be added by mistake. The addition of a varnish whose resin is only slightly soluble in the varnish and its solvent in the tank is an example. Here the foreign resin would be precipitated out, possibly as troublesome colloidal particles.

Contaminants may be generally classified as conducting and non-conducting. Carbonaceous dust, metal particles and electrolytes are conductors. Non-conducting particles are represented by wood chips, and precipitated or polymerized resins, pieces of cotton, asbestos and mica dust. This material comes from pieces of insulation washed off the coils and wound apparatus on immersion in the varnish bath.

These contaminants periodically require rehabilitation or disposal of large quantities of varnish. To prolong its use and avoid its disposal, and to conserve critical materials and maintain the high insulating values needed, a satisfactory method of cleaning the varnish has been developed. Portable pressure filters have proved ade-

quate for this operation. In addition, a system for control and test of these varnishes has been developed which indicates when filtering is needed.

Contamination may be classified into three types by use of wet and dry dielectric tests and heat endurance tests. Conducting particles may lower both wet and dry dielectric strength, and very probably impair the heat endurance of the varnish. A second type is identified by a high dry dielectric strength, a low wet dielectric



Fig. 2—Cleaning the stainless steel filter plates of a portable pressure filter—Extreme care must be exercised to keep every one of the 1/16-in. holes open—For filtering, pressures of 15 to 28 lb. per sq. in. are used, with rates of flow varying from one to five gallons per minute, depending upon the pressure, amount of cake and viscosity of filtrate

\* Insulating development engineers, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

strength, and a low heat endurance. Contamination producing varnish gels or precipitated resins might not lower the dielectric strength but might lower the heat endurance or life of the varnish film.

Disruption of the varnish film by particles of foreign matter seriously impairs the properties of the insulation. On electrical equipment there is no need to mention the

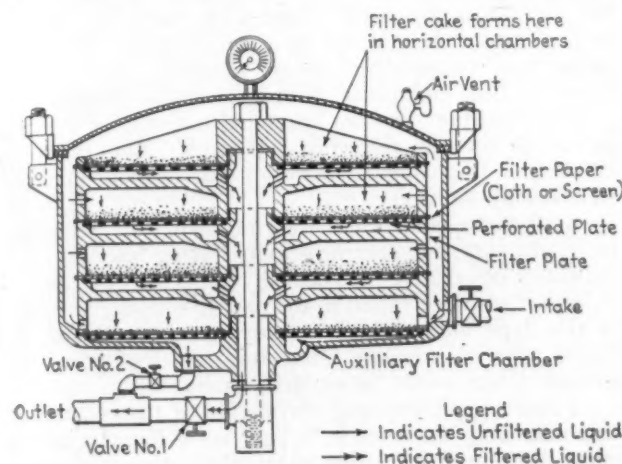


Fig. 3—Cross-sectional view of horizontal plate, pressure type filter

effect of electrically conducting or ionizing particles on the dielectric breakdown value, particularly when they become inbedded in the insulation. In some cases, although the particles are not conducting, they cut into the insulation during processing, lowering the breakdown level of the material.

Thus, it is important to keep varnish for treating electrical equipment as clean and as free from foreign material as possible. As a base or goal, the electrical properties and mechanical properties should be kept in the same order of magnitude as those of the new varnish.

Careful control of the varnish requires an adequate filtration method. The materials used in varnish manufacture are critical and maintenance of the varnish in usable condition is essential. The particle sizes of contaminants range from large pieces of wood to colloidal carbon. Pieces of metal as small as .003-in. in diameter have been found. A study of the available methods indicates that the most efficient method of reclamation of the varnish and conservation of critical materials is by pressure filtration.

### Pressure Filtration

A portable type pressure filter, consisting of a number of plates arranged vertically and enclosed in a shell, was found to be satisfactory. Pressures of 15 to 28 lb. per sq. in. are used with rates of flow varying from one to five gallons per minute depending upon the pressure, amount of cake and viscosity of filtrate.

Filtration was carried out, using a diatomaceous earth as a filter aid. This was found to be particularly necessary since some of the contaminating material filtered out was a gel, and quickly filled up the pores of the filter medium. The addition of filter aid allowed a porous cake to build up which was not as easily clogged as the filter medium alone. In order to avoid addition of the filter aid to the large varnish tanks, two 100 gallon tanks were set up in which the diatomaceous earth was continuously mixed with the incoming varnish stream. Varnish was pumped from here through the filters and into a clean tank in the system.

In addition, strainers which eliminate particles greater

than 20 mils in diameter have been installed in the tank system. The particles which are particularly troublesome are, in general, below 20 mils in diameter.

Filtration of varnishes in tanks in shop use presents more problems than filtering of new varnish. New varnish will not have the detrimental foreign material such as metal chips, white lead, carbon dust, that varnish in shop use will accumulate. However, new varnish may need to be clarified by use of filter-aid and pressure filtering, centrifuging or settling, or some combination of these methods. The advantage of filtering newly made varnish is that it may be handled while hot, with resulting low viscosity. Frictional losses are much less at lower viscosities, so that a greater "through put" results. The flow rate is in inverse proportion to the viscosity.

Varnish in use in repair shops obviously cannot be heated because of fire hazard and heat causes rapid polymerization, with a resulting short tank life. Filtering must be done at room temperatures, usually 20-35 deg. C., with consequently higher viscosities. The viscosity will vary with the type of varnish and condition of the varnish in the tank. A rise of temperature in a varnish tank from 25 to 35 deg. C. will lower the viscosity approximately 50 per cent, so it is important to filter at 25 deg. C. or higher, if possible. In addition, it is possible to handle different types of varnish in a portable shop filter. When changing from one varnish tank to another, careful cleaning of the filter is required.

### Effects of Filtering

The efficiency of the filtering treatment is judged by a series of chemical and physical tests on samples taken before and after filtration. Viscosity at 25 deg. C. per cent of solids, and specific gravities at 25 deg. C. are checked. Significant results are obtained from dielectric tests and a heat endurance or life determination test made on a varnish film. Heat endurance is determined by depositing varnish films of .002-in. thickness on copper strips. These are continuously heated at 150 deg. C. and the time noted to produce failure of the film on bending about a 1/8-in. mandrel. Dielectric tests consist of measuring the dielectric breakdown strength

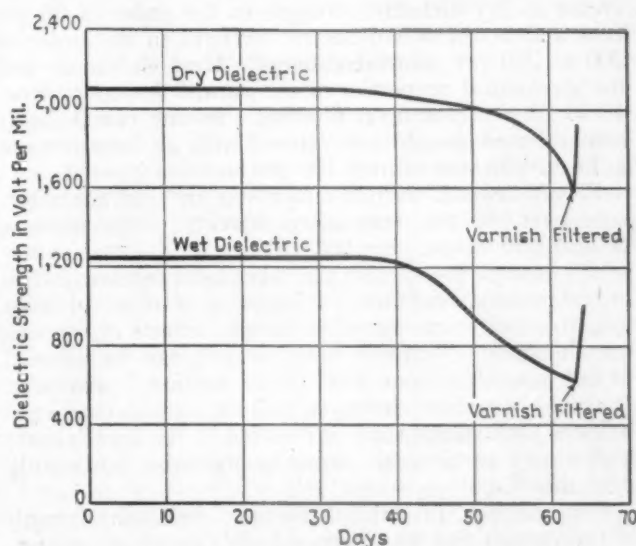


Fig. 4—Wet and dry dielectric strength of a heat reactive varnish "before" and "after" pressure filtering—The dielectric strength remains fairly constant for 40 days, then it starts declining—At the end of 60 days it has reached a point about one-half normal value—After filtering it has returned to its normal value



of a .002-in. thick varnish film on each side of a 5 mil copper sheet, both as received and after immersion in water for 24 hours.

Filtering of shop varnish tanks has given information on the behaviors of various varnishes under continuous use. Information has been obtained on varnish filtered through portable pressure filters in lots of 100 to 2,000 gallons. Varnishes varying from asphalt gums dissolved in naphtha-type solvents to synthetic resins

Table I—Filtration of Heat Reactive Varnish

	Before filtering	After filtering
Viscosity (secs.) at 25 deg. C. ....	162	157
Body, per cent .....	53.59	53.57
Specific gr. at 25 deg. C. ....	0.977	0.977
Heat endurance at 150 deg. C. in hrs. ....	46	64
Wet dielectric, v.p.m. ....	623	1,100
Dry dielectric, v.p.m. ....	1,597	1,914

Note: This tank is used for treating wound apparatus and repaired armatures.

Table II—Filtration of Heat Reactive Varnish

	Before filtering	After filtering
Viscosity (Secs.), at 25 deg. C. ....	338	310
Body, per cent .....	59	59.08
Specific gravity, at 25 deg. C. ....	0.997	0.995
Wet dielectric, v.p.m. ....	935	1,050
Dry dielectric, v.p.m. ....	1,610	2,200

Note: This tank is used for impregnating coils.

Table III—Filtration of Asphalt Base Varnish

	Before filtering	After filtering
Heat endurance at 150 deg. C., in hrs. ....	22	31
Dry dielectric, v.p.m. ....	791	946
Wet dielectric, v.p.m. ....	1,591	1,665

Note: This tank is used for dip coating coils.

in toluene were filtered. Each varnish presents a different problem as to "through-put" and rate of flow to produce desired clarity and removal of contaminants. Samples of the varnish were taken before, during and after the filtering operation. Percentage of body, viscosity, and specific gravity show whether or not there is a loss of solvent or varnish resin during the filtering operation. The results of the heat endurance tests and dielectric tests before and after the operation show whether or not harmful foreign materials were present and if they have been removed.

Typical results of filtering different kinds of varnish are shown in the accompanying tables.

Improvements in dielectric properties produced by filtering the varnish are remarkable. An average increase in dry dielectric strength in the order of 30 per cent and in the wet dielectric strength in the order of 200 to 250 per cent were found. Heat endurance and the mechanical properties of the varnish improved from 10 to 20 per cent upon filtering. In one case a badly contaminated sample was filtered with an improvement in heat endurance of over 100 per cent being noted.

Plastic asphalt varnish improved in this characteristic over 40 per cent after filtering. An increase in heat endurance indicates particles of colloidal matter which damage the varnish film have been removed. The improvements cited are examples of varnish in poor enough condition to show the harmful effects of extreme contamination. Varnish tanks should not be allowed to fall to such a poor level under ordinary conditions. It should be realized, however, that the varnish characteristics of tank varnish can be restored to the approximate level of new varnish, but cannot be improved significantly over that level.

For example, in Table I the wet dielectric strength of the varnish film was increased after progressive filtering until a dielectric breakdown of about 1,100 volts per mil was obtained. This is essentially the same as new varnish. Reference to the curves, Figs. 4 and 5, shows bi-weekly checks on the dielectric strength and

heat endurance of varnish from the same 2,000-gallon tank for a period of 60 days. After 40 days, the wet and dry dielectric strength started to decrease and the wet dielectric strength reached a point about one-half of the normal value in 60 days. After filtering, the dry dielectric breakdown returned to its normal value of about 2,000 volts per mil. It is interesting to note the effect of the addition of a varnish incompatible with the varnish in the tank. Less than three per cent of such a varnish was added to a sample from this 2,000-gallon tank twenty days before filtering. The adverse effect on heat endurance, Fig. 5, is easily discernible.

This condition was not corrected entirely by filtering, as can be seen by reference to Fig. 5. This is an example of a fine colloidal material that cannot be readily removed by filtering.

In all tanks cited there was no change in percentage body, viscosity, and specific gravity during filtering. This indicates no change in varnish composition. Serious objection has been raised in the past to filtering varnishes of this type, due to loss in body or resin. Using the closed type of pressure filter, the only loss noted was solvent, which could be replaced easily.

From compilation and correlation of these data with manufacturing experience, it has been found that frequent filtering of insulating varnishes is necessary during shop use to maintain the high insulating level of the varnish film and to prevent possible mechanical damage of insulation by foreign particles. Portable pressure

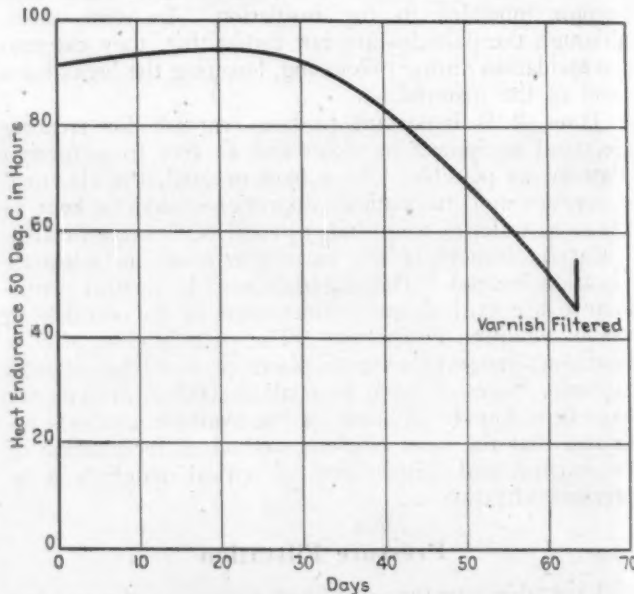


Fig. 5—Heat endurance of a heat reactive varnish "before" and "after" pressure filtering—The adverse effect on heat endurance is easily discernible—Filtering did not entirely correct as there remained a fine colloidal material not readily removed by filtering

filters proved satisfactory for this operation. It is apparent that the type of contaminant depends upon the material treated in the tank. The length of time between filtering operations depends upon the use or activity in the tank and the care taken in operation of the tank. Insulation varnishes are complex chemical mixtures, and care should be maintained in their use. The use and maintenance of varnishes are chemical engineering operations; therefore it is important that they be under the control and supervision of persons with the proper training and experience. Filtration of electrical insulating varnish is a step forward in the conservation of those critical materials used in its manufacture.

# Radio Channels Accepted

ON January 16, 1945, the Federal Communications Commission issued a report bearing the title, "In the Matter of Allocation of Frequencies to the Various Classes of Non-Governmental Services in the Radio Spectrum from 10 Kilocycles to 30,000,000 Kilocycles," (Docket No. 6651). This report proposed that the railroads be assigned 33 clear channels in the 156 to 162 megacycle band and that they share certain other channels in the television and other bands.

At a hearing held in Washington, D. C., on February 28-March 2, 1945, all interested parties were given the opportunity to voice their opinion of the Commission's proposals. The railroads' reply was offered in a joint brief prepared by the Association of American Railroads and Committee 7, Railroads' Radio Communications Services, Panel 13, Radio Technical Planning Board.

The commissioners assigned to the hearing were Paul A. Porter, chairman, E. K. Jett, Paul A. Walker, Norman S. Case, C. J. Durr, and Ray C. Wakefield, five members sitting through all of the proceedings. The railroads' joint brief was presented by William J. Milroy, attorney, Atchison, Topeka & Santa Fe, acting as counsel, Association of American Railroads.

The following is the joint brief:

## Railroads' Reply to Commission's Proposals

1. In its proposed allocation of frequencies to the railroads, dated January 15, 1945, the Commission states: "As in the case of other services in this portion of the spectrum, an average channel width of 60 kc. is assumed. It is further assumed that adjacent channels will not be used in the same area." We do not fully understand the Commission's statement in respect to 60 kc. being assumed for other services in this portion of the spectrum when we note on page 47 of the Report 200 kc. bands are allowed for aviation services as low as 118-132 mc. The aviation service in our opinion is not subject to any operating conditions more severe than the railroads insofar as frequency stability factors are concerned.

As pointed out in our testimony at the hearings, Dockets 6593 and 6651, we do not believe that it is practicable at the present state of the art to work within such a narrow channel at frequencies of 156 to 162 megacycles. Panel 13, Steering Committee, at the time of the hearing, Docket 6651, recommended allocations on the basis of 60 kc. channel widths. At the meeting of Committee 7 in Chicago on December 12 and 13, 1944, we again considered the channel width problem and in discussing the matter with Professor Noble, chairman of Panel 13, were advised that 100 kc. instead of 60 kc. were presently recommended by the Steering Committee for frequencies above 132 mc. and that the R. M. A. Emergency Service Equipment Committee favored 120 kc. Obviously, if the majority of the Steering Committee of Panel 13 who had previously recommended 60 kc. could change its views so quickly something was radically wrong with its first views.

## 60-kc. Width Impracticable

In order to determine if the manufacturers could presently supply us with equipment that would operate on 60 kc. channel width we wired the RCA, General Electric,

## F. C. C. proposals receive approval of railroads with requests for minor changes only

Westinghouse Electric & Mfg. Company and Bendix Radio, as follows: "Radio service being established for railroads between 156 and 162 megacycles with 60 kc. band width. Please wire us promptly at Indianapolis if your company is in a position to presently furnish radio equipment that will operate on 60 kc. band width under railroad conditions." Their replies are attached, and you will note they are unanimous in their view that 60-kc. channel width is presently impracticable.

We also do not believe it will be practicable to work adjacent channels even at 100 kc., which view is confirmed by both Bendix and General Electric in their replies mentioned above.

In effect, therefore, the 33 channels allocated with 60 kc. channel width or a total of 1,980 kc. band will provide 19.8 channels of 100 kc. and assigning them alternately afford only 10 clear channels. If actual experience indicates that additional space is required we will rely on the Commission's assigning us such space in the unassigned portions of the 156- to 162-mc. band and in the 102- to 108-mc. band as mentioned in the report.

2. Considering now the channels assigned for yard and terminal operation, while we do not note that channel widths in these services are mentioned, we assume the Commission had in mind 60 kc. for the 192-216 mc. band and in such event the previous statements in connection with the end-to-end service will apply insofar as channel widths are concerned. For the bands 44-50 mc. we assume 40-kc. channels will be allocated and for 54-78 mc., 50-kc. channels.

## Television Bands

As far as we know, no one at present is in a position to say whether it will be practicable to operate in interspersed television bands. At the meeting of Panel 2 in Washington, D. C., November 1, 1944, it was observed that none of the experts present committed themselves to an outright statement that such a plan was feasible. Attention is called to a statement of Professor D. E. Noble, chairman, Panel 13, to the Commission on the report of Panel 2, wherein he states: "I am extremely pessimistic about the success of the proposed share-the-channels Television-Mobile Communication plan."

Also, we call attention to a memorandum prepared by Mr. David B. Smith, chairman, Panel 6, Television, R. T. P. B., dated October 30, 1944, on the Joint Use of Channels by Television and Communication Services. In this memorandum, under the title, "Adjacent Channel Interference," Mr. Smith states: "Again neglecting tropospheric effects, adjacent channel television stations can be reassigned at about 85 miles with the limitation that between the 5.0 mv/m and the 0.5 mv/m contour, the television user will probably receive only one of the two



stations. The communication service can operate on the adjacent television channel but only in the vicinity of the television station, otherwise the communication service will interfere with television service. The size of this communication area will depend upon the relative power of the television service and not of the communication service. The higher the ratio of television power to communication power, the further the communication power can be from the television station. In any case it appears that the communication area will be local in area and its transmitter cannot be very far from the television transmitter."

Note particularly that it is Mr. Smith's opinion that the interspersed communication can operate on an adjacent television channel only in the vicinity of the television station; otherwise, it will interfere with the television service and by the same criterion we can well imagine the interference that will result to the communication service from the television station.

Again, at a joint meeting of Panel 2 and Panel 13 in New York on December 20, 1944, it was observed that serious doubt existed in the minds of many present as to the practicability of the proposed sharing and a subcommittee of Panel 2 submitted the following report:

"1. The subcommittee of Panel 2 is unable to develop a plan of shared channel operation between communication services and television broadcasting services. This is not to say that such a plan might not be accomplished but more data and experience will be required than are now available. One difficulty has been the lack of jurisdiction of the Committee to make any determination of channel allotments to the several services on the basis of public interest, convenience and necessity.

"2. Therefore, the subcommittee recommends that allocations be made to the services on the basis of exclusive assignments as between television and communication services. This is not to exclude geographical channel sharing between the several classes of communication service."

Taking the above into account we are very much concerned as to the practicability of the proposed allocation by the Commission, especially since about two-thirds of the total frequencies allocated to us are on an interspersed basis. We recommend, therefore, that the Commission allocate cleared channels for these services in the unassigned portions of the 156- to 162-mc. band and in the 102- to 108-mc. band, as mentioned in the report.

3. No mention was made in the Commission's report of our desire to use end-to-end, yard, terminal and point-to-train frequencies interchangeably as brought out in our Report M-1940 and in our Report M-2019 to which was attached M-2020-2.

A number of railroads, due to pooling of power and for flexibility in operation, desire to use the frequencies assigned them interchangeably and since any interference that would result will be internal to the railroad concerned we assume the Commission would have no objection and we would recommend that the usage be confirmed by formal action.

4. We also note that no mention was made in the Commission's report of our desire to use such frequencies as may be assigned for end-to-end, yard and terminal operation, in harbor craft service or tug boat dispatching, as stated in our Preliminary Report No. 4, M-2019. It is assumed that the Commission will have no objection to the railroads utilizing these frequencies for this purpose and we would recommend that the usage be confirmed by formal action.

The report is signed by William J. Milroy, counsel, Association of American Railroads and John L. Niesse,

chairman, Committee 7, Panel 13, R. T. P. B., and representing the Association of American Railroads.

### Oral Testimony

Oral testimony was presented by John L. Niesse as follows:

"Although the railroads are pleased with the flumber of channels proposed for them, there are two important factors which we feel will very seriously reduce the number of these channels to a much smaller amount than stated in the report.

"The first of these important points is the narrow channel width assumed. In its report, the Commission recognized the need for and allocated to us 33 channels for end-to-end and point-to-train service, but the allocations have been proposed on an assumption of a 60-kc. channel width. As we previously advised the Commission, we do not believe it is practicable in the present state of the art to operate on such a narrow channel width at frequencies of 156 to 162 mc. In order to definitely determine the practicability of obtaining equipment that would operate on a 60-kc. channel width under railroad conditions, we asked the RCA, General Electric, Westinghouse Electric & Mfg. Company and Bendix Radio if they could supply such equipment. They were unanimous in their view that it would be impracticable. Therefore we believe, as do the manufacturers, that the minimum channel width should be 100 kc.

"We appreciate the fact that it is possible under certain ideal conditions to build a set that will operate on a 60-kc. channel width but we do not believe it practicable to do so in a mobile set for use in railroad service.

"In requesting 100-kc. channel widths, we feel that we are not unreasonable when it is observed that the Commission has allocated 200-kc. channel widths to the aviation service for frequencies as low as 118 to 132 mc. The aviation service in our opinion is not subject to operating conditions that are more severe than those encountered on the railroads insofar as frequency stability factors are concerned.

### Further Recommendation

"I should also like to point out that testing in the 156 to 162 mc. band has been with amplitude modulated equipment. We have not as yet been able to determine whether eventually AM or FM operation will be the more advantageous. Should it finally be determined that FM operation presents outstanding benefits, then we would require a channel width of 150 kc. instead of 100 kc.

"Even at a 100-kc. channel width it will not be possible to operate on adjacent channels in the same area. This view is confirmed by both General Electric and Bendix Radio. The matter of operating on adjacent channels can be best illustrated by reference to the Chicago terminal area upon which the 33 channels are based. The commission has proposed 33 channels, 60-kc. wide, but it assumes that adjacent channels will not be used in the same area. On this basis, therefore, we will have only 16 channels. If these 16 channels are only 60-kc. wide and our equipment requires 100 kc., the result will be that the number of channels will be reduced to about 10 interference-free channels.

"So that our use of radio may not be restricted, we recommend that the Commission assign us sufficient space, preferably in the unassigned portions of the 156-162 megacycle band or in the 102-108 megacycle band, to provide a total of 33 channels 100-kc. wide for end-to-end and point-to-train service. Only by so doing will



the railroads have available the number of channels recognized by the Commission as necessary.

"The other point I wish to stress is that all the frequencies proposed for yard and terminal service are to be shared with television. We are very much concerned about this sharing plan. As far as we know there is no test data available to indicate that such an arrangement is feasible, nor do we know of any experts who will say definitely that such an arrangement will work. In fact, Mr. David B. Smith, chairman, Panel 6, Television, has said in a memorandum on this subject that the communication area of a railroad set operating under this shared plan will be local and the railroad transmitter cannot be very far from the television transmitters.

"Again, at a joint meeting of Panel 2 and Panel 13, a subcommittee of Panel 2 recommended that allocations be made to the services of the two panels on the basis of exclusive assignments as between television and communication services. In our brief we recommended interference-free channels for yard and terminal service and while we would very much like to see interference-free channels made available for yard and terminal operation, particularly for the number of railroads who have indicated they will use radio if frequencies are allocated, we fully appreciate the large demand for frequencies in this particular portion of the spectrum. Consequently, we intend to go ahead on the shared plan proposed by the Commission. If interference develops we will rely on the Commission to make available to us an adequate number of channels as found by the Commission in its report to be reasonably required.

"One final point: For flexibility in train operation, we desire to use the frequencies assigned for end-to-end, point-to-train, yard and terminal, interchangeably, and also to use these frequencies for tug boat dispatching. Since any possible interference that might result would be internal to the individual railroad concerned, we presume the Commission will have no objection to this. However, since the question has been raised by a number of railroads, we recommend that this interchangeable usage be confirmed in the Commission's final report."

## Corrosion of Underground Pipe Lines\*

Recognition of the facts that no iron or steel pipe which is economically available can be expected to last long in some soils and that protective coatings usually only delay corrosion, has emphasized the importance of other methods of protecting pipe. The most promising of these is electrical. If electrical connections are so made that current flows to the pipe line, the pipe will be protected from corrosion. This is done in many installations by supplying energy from a power plant. Considerable use is also made of zinc anodes electrically connected to the pipe lines. In 1941 the National Bureau of Standards began a series of field tests to determine the conditions under which this method of protection may be effective. (Technical News Bulletin 296, December, 1941.) Experimental combinations of zinc and steel were buried at eight test sites, so arranged as to give different ratios of area of zinc to that of the steel. During the last month some of the specimens from a site near Shreveport, La., were returned to the Bureau. These show that a sample of steel not connected to the zinc lost from 40 to 50 times as much metal as

\* Notes from the National Bureau of Standards as prepared by the director for the Journal of the Franklin Institute.

similar samples connected to zinc anodes. These observations are, of course, preliminary and further measurements will be necessary in order to determine the best methods of using the zinc. Moreover, it may be found possible to replace the zinc by aluminum or magnesium, thus providing a use for these metals of which large quantities are likely to be available. Arrangements are being made to bury test sets of these metals during the coming spring.

## Loudspeaker For Wrecking Operations

To promote efficiency and safety, the Central Railroad of New Jersey has installed a public address system on a service train which amplifies and directs the wreckmaster's voice to the work location and also to the crane operator. The installation was made as an experiment in overcoming the difficulty of indicating crane movements by a code of whistle signals.

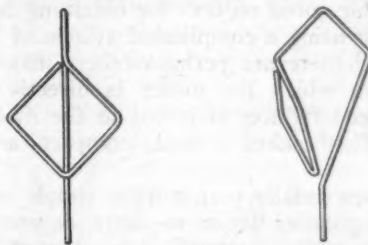
The wreckmaster talks into a microphone on the end of a 150-ft. cord and his voice is amplified by a horn-type loud speaker mounted on the boom of the crane. A second smaller speaker in the cab transmits his voice to the crane operator.

The equipment used consists of a 20-watt amplifier at the base of the boom, a University PH horn equipped with a 15-watt S. A. H. driving unit on the boom and a Utah TW8 speaker in the cab. The crane operator also may speak into the address system by means of a push-to-talk microphone located in the cab. Depression of the button cuts the microphone into service and cuts out the speaker in the cab. Power for operation of the system is supplied by a 32-volt d.c. turbo-generator set. An inverter operating from this set supplies 110-volt 60-c./c. current to the amplifier.

## Wire for Fishing Conduit Runs

By Thomas Trail

In pulling electric wires through conduits, flat steel tapes are generally used. But where the run between pull boxes is comparatively short, it is often easier to use a length of fairly stiff spring wire, such as music wire. This is especially convenient where there are a number of bends in



Front and side views of loop used for conduit fishing wire

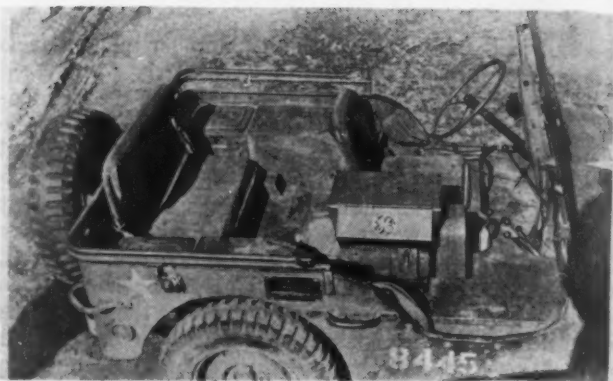
the conduit because the slender wire will slide through the conduit easier since it can bend in any direction, whereas the tape can not easily bend edgewise around sharp corners.

To enable the spring wire to negotiate the conduit turns even more easily, the type end loop shown should be bent in the wire. This loop will travel with equal ease in all directions.

## Jeep-Mounted Welders

Modified G-E arc welders mounted on standard quarter-ton army jeeps are being used extensively by maintenance organizations dispatching contact parties in the combat areas. Because of their compactness and light weight, as well as their maneuverability over difficult terrain, these mobile units have also been adopted for jungle operations and are expected to be used for airborne and amphibious operations. It takes little imagination to conceive of the many ways in which equipment of this kind might be used in railroad service.

Driven by a V-belt on a power take-off from the jeep's engine, the welder is bolted to the floor of the jeep in place of the right-hand front seat. It provides 40 to 250 amp. and is capable of handling electrodes of various sizes up to and including  $\frac{1}{4}$  in. The welder is ready for use as soon as the jeep is stopped. A governor, which is disengaged by a hand-operated clutch for normal operation of the vehicle, maintains the engine speed during the welding operation, while belt guards



A 200-amp. 30-volt welding generator mounted in a  $\frac{1}{4}$ -ton Army jeep and heavy protective covers safeguard the personnel. When not in use the welder does not interfere with the customary use of the jeep, since the closed cover serves as a seat.

## CONSULTING DEPARTMENT

### Motor Mounts For Machine Tools

*We are using a line shaft driven by a 15-hp. three-phase motor to run several machines in our machine shop. As soon as conditions permit, we intend to install individual motors. Would it be cheaper to build the necessary harness ourselves or buy it already built?*

#### The Answer Is Usually In A Catalog

It is a comparatively simple job to motorize some shop machines and quite complicated for others. Some power-driven hacksaws, for example, offer quite a problem when it comes to building suitable harness for mounting a motor, although there are instances where home-made jobs are quite satisfactory.

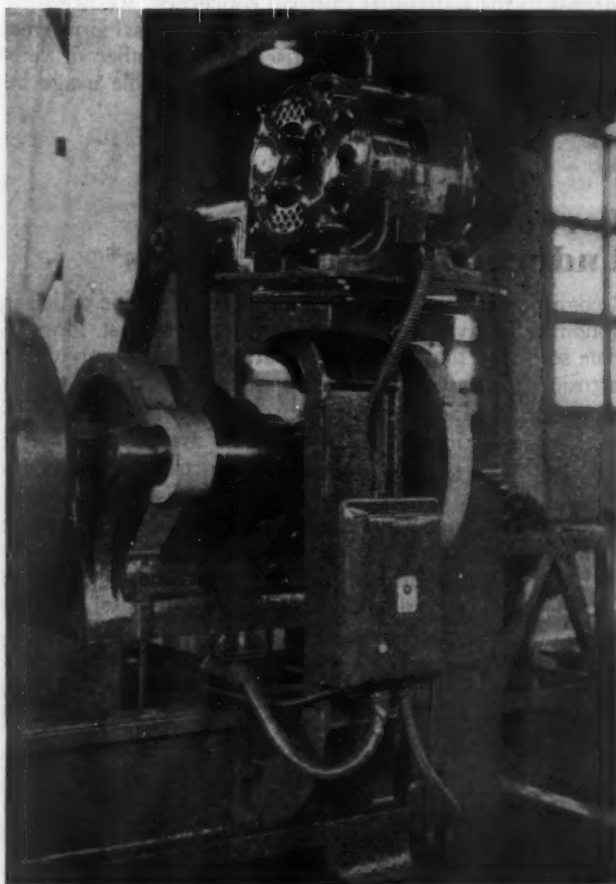
Metal-turning lathes also usually offer some difficulty in mounting a motor without using a counter shaft, because it is often impossible to reduce speed sufficiently with one belt to make the lathe slow enough. Purchased equipment for mounting a motor on a lathe usually includes some type of suitable speed reducer for obtaining correct lathe speed without using a complicated system of belts. One company, and there are perhaps others, has a variable-speed unit to which the motor is directly connected. Then the speed reducer is belted to the machine being operated. This makes a neat, compact, and efficient installation.

Drill presses usually permit quite simple mounting of a motor, using either flat or vee-belts, depending on distance between pulley centers. An outboard bracket on which to mount the motor can usually be clamped or bolted to the upright members of a drill-press frame.

If total hours spent figuring a job, laying out and building necessary equipment to mount a motor on a machine are figured along with the cost of material used, it will ordinarily cost less to buy a ready-made harness. Sometimes, however, it might be possible to do the work when men would otherwise be doing nothing and use material that would otherwise be scrapped and motorize a

Can you answer the following question? Answers should be addressed: Electrical Editor, *Railway Mechanical Engineer*, 30 Church Street, New York 7.

*Why are apparently similar sets of transformers sometimes installed in vaults and sometimes on poles or pole platforms? What factors govern the choice of installation?*





machine with very little added expense. This also depends on whether or not mechanics available are experienced in this type of work. An inexperienced mechanic without ingenuity can use lots of time and turn out an unsatisfactory job where a mechanic trained in that class of work and accustomed to using his head would turn out a good job at relatively low cost. W. L. COTTON

### Buy Them If You Need Them

My answer to the question of motor mounts is: Better buy them if you are certain they are the answer to your problem, even though the cost of adapting and applying the motor and the mount to the machine may exceed the purchase price of the mount.

Personal experience with a few such jobs has caused me to design and build the mounts in some cases where I already knew the problems of that particular machine and there were enough machines to warrant the cost of drafting and patterns. I found it better to buy where I was exploring into unfamiliar territory or was uncertain about patent rights on such mounts and only had one machine of each type to change.

It is quite possible that attempting partly to modernize obsolete machines will cause more headaches than the present layout is causing, so there should be a pressing need for such a change, with no alternative available. Almost all such changes are made by machine-tool jobbers who dress up an obsolete machine discarded in favor of a modern machine with built-in motor drive, and then use the improvised individual drive as a sales appeal. In fact, the inquirer will find his best source of information on motorizing old machine tools in machine-tool jobbers' catalogs and sales rooms, and will find it advisable to visit such sales rooms before deciding the question of whether there is a good reason for the change or it is just an idea that individual drives will be better. Keep in mind that such a change cannot improve the machine itself, and that it will increase capital investment and will cause some obsolescence of other equipment.

Can you visit sales rooms or other shops to see the rig in action, so that you can be certain the mount you buy will fit your machine? It is quite likely that you can see which is best to buy and which is best to build, but it is more likely that you will consider more closely the advisability of buying a modern machine with individual motor drives built into it.

Do you have any personal friends, running their own shop, who have made these changes? I know three of them, and without exception they regret the changes. In fact, one of them had one of the best possible reasons for changing, namely, removal to a new and larger building where the cost of re-installing line and countershafts would help to offset the wiring costs, and his experience was most unfortunate. He sold good motors and shafting, hangers, countershafts and belting at about 40 per cent of new value and paid several thousand dollars for individual drives and costs of application. He then found he could not amortize the costs, because there was no increase in production from the machines. His power bill increased over 15 per cent, his maintenance charges were only reduced about 35 per cent, and he lost about a week's production with each machine while installing the new motor mounts.

There are some special cases, where an improvised individual motor mount is obviously desirable. For example, a machine may have to be placed under a crane, or the portability of the machine may be necessary. When machine tools were scarce as they were in 1917 and 1941 there was need of using every available ma-

chine tool, regardless of efficiency, but even in this case the users should make certain that it is cheaper to use an improvised individual drive than a line shaft. Be sure you are not just throwing one thing away for another and that competent operators are available who can make full use of the machine. LINWOOD SKELLENGER

### Railroads Not Manufacturers

There is some doubt as to just what is meant by the term "harness" as used in the above question. It probably refers to the mounting, gear reduction, and other mechanisms that will be required to install the individual motors on the several machines in the shop. Regardless of what is intended by the term, it can be said that it generally does not pay for a railroad's electrical shop to make any sizeable piece of equipment that can be purchased on the open market.

When an electrical repair shop builds equipment that could have been purchased from a catalog, they are usually wasting time and throwing away money. In the first place, someone has to do the designing. The design may be entirely in the mind of the foreman, or it may be a detailed drawing. In the first instance, the foreman has to convey his ideas to a mechanic, and this takes time. In the second instance, the draftsman has had to spend time on the design, and his salary should be charged to the job. Then the foreman or a mechanic has to find the material from which the article is to be constructed. And last but not least, someone has to get to work and build the device. In some railroad shops the labor for building the device may be charged to maintenance of equipment, maintenance of ways and structure, or some other account that will stand the extra charge. Nevertheless, the charge is there and the thing that has been made has actually cost the company a lot of money, even though it does not show in the accounts. If the machine really works, and works successfully, everything will be fine from here on, but in most cases there is a period of experimentation with any newly designed device. Sometimes the device has to be changed, and that may mean tearing down and rebuilding the whole machine. This will prove to be anything but an inexpensive procedure. Then there is always the possibility that the shop-made machine may be dangerous. It may fail and injure some of the personnel, or at least it might cause damage to other valuable machinery in the plant where it is installed.

Compare the above roundabout procedure, with the cost of looking up the best standard device in the catalog of a well known manufacturer, and the placing of a requisition for its purchase. The purchased device will in most instances be factory tested, and will prove entirely satisfactory. Furthermore, it will also cost less in the long run than the home-made device.

Sometimes maintenance and repair men are compelled to build something that would have been purchased if the "boss" had been willing to sign the requisition. Unwillingness on the part of railroad supervisors and officials to approve requisitions for necessary material, just because the price seems to be high in a short-sighted policy in many instances. Railroad employees are resourceful people and often they will get what they want regardless of the "boss" or the cost.

As to whether the "harness" should be built in your own shop, or purchased already built, it seems safe to say that if it is a standard catalog item, it should be requisitioned through the usual channels and the boss should approve the purchase. P. C. FREDKY



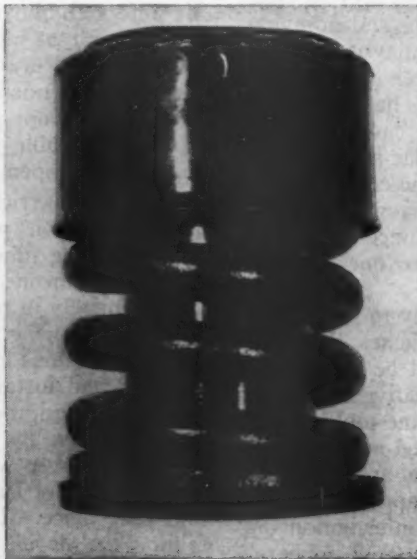
# NEW DEVICES

## Shock Absorber For Freight Cars

Based on experience gained in equipping a large percentage of all railroad passenger cars built since 1936 with hydraulic shock absorbers and a notable record as exclusive manufacturers of shock absorbers for U. S. tanks, jeeps, scout cars and heavy trucks, the Monroe Auto Equipment Company, Monroe, Mich., has recently announced the development of a new hydraulic shock absorber for freight cars. Specific objectives sought in the development of the new shock absorber are uniformly dependable performance in cushioning shocks to lading and car structures, quiet, efficient action, long life and general freedom from the necessity of servicing.

The new hydraulic shock absorber is a small, compact and self-contained unit, as shown in the illustrations, which replaces one conventional truck spring in the spring cluster supporting each end of the truck bolster. It offers hydraulic resistance to the compression movements and contains an external spring which carries part of the load imposed by the weight of the car and also returns the shock absorber to its original position. Hydraulic resistance inside the pressure chamber is controlled by a series of spring steel discs used in conjunction with a predetermined metered

orifice. The control can be varied to meet any required condition by using the proper combination of orifice and pressure relief. The pressure chamber is surrounded by a large oil reservoir chamber to compensate for the displacement of the piston rod.



Hydraulic shock absorber for freight cars

In operation, oil passes from the reserve to the pressure chamber through a non-return valve in the lower part of the pressure chamber. The unit is a sealed assembly at the lower end so there can be no leakage at this point, and the upper end is sealed with synthetic rubber seals. This hydraulic shock absorber is said to utilize a type of oil which assures uniform action under all temperature and weather conditions.

Another new development of this company is a stabilizer designed to minimize the swaying of freight cars caused by track irregularities or curves. This device consists primarily of a torsion bar extending across each truck and connected between the bolster and truck frame in such a way that any tendency of the car body to rock on the truck centers is resisted by torsion in the bar. This type of device has demonstrated its value in passenger service.

In the field of passenger-car hydraulic shock absorbers, the Monroe Auto Equipment Company has also effected a number of improvements. The new shock absorbers are said to be lighter and more economical, both in original cost and in use, higher pressures are possible because of the closer tolerances and improved finishes on the pressure chamber, shaft guide, shaft, valves and valve seats.

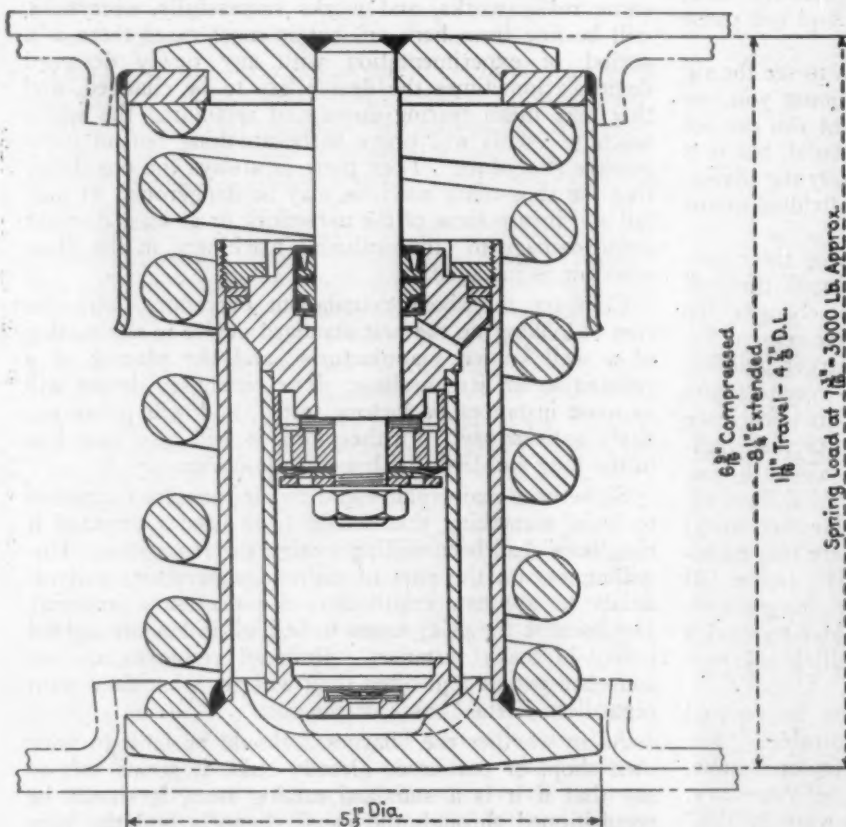
## A Slide Rule That Locates Decimal Points

A Decimal Point Locator and slide rule that will determine the decimal point mechanically in involved expressions with results up to 19 places is announced by Pickett & Eckel, 53 W. Jackson Blvd., Chicago 4.

The device so simplifies slide-rule calculations that persons with a very limited mathematical background can evaluate and point off problems containing cube root, square root, log and trigonometric factors.

The streamline functional design of scale arrangements on the Decipoint slide rule gives the computer five distinct advantages over old style slide rules: (1) Places decimal point with mechanical accuracy up to 19 places in involved expressions (0.0000000000000000001496); (2) gives 30-in. scale accuracy for cube root; (3) gives 20-in. scale accuracy for square root; (4) synchronized scales permit result, square root, cube root, and log readings to be taken off the same one setting of the hairline; and (5) one setting of hairline of the Decipoint locator (which can be used with any slide rule) also determines the decimal point location of result, square root, and cube root, up to 19 places.

The illustrated instruction Manual, written by M. L. Hartung, associate professor of the Teaching of Mathematics, the University of Chicago, gives instructions for beginners, rules for operating the Decimal Point Locator, and presents the mathematical theory of mechanical decimal-point location.

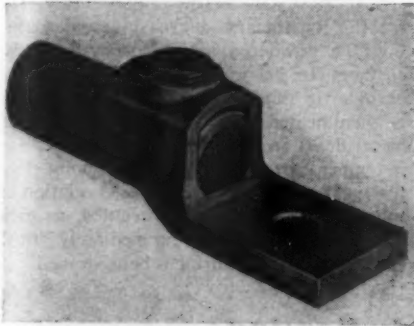


Sectional view showing construction of new freight car shock absorber

These rules are now made of a high grade tag stock varnished to render them moisture proof. They have been found to maintain their accuracy under daily use for over a year. As soon as the war situation permits, they will be offered in plastic form, under a trade-in arrangement with owners of the present less-durable models.

## Connector Lug

A solderless lug that will accommodate more than one size of wire, designated as the Type XL lug, has been developed by the O. Z. Electrical Manufacturing Co., Brooklyn, N. Y. It is made of cast copper

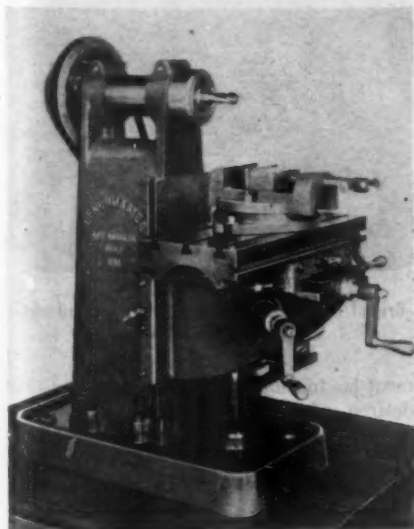


The lug is designed to accommodate various sizes of wires

alloy, and clamping pressure is exerted by a pressure plate which insures high conductivity on conductors in a wide range of sizes. Socket wrenches are furnished without cost.

## A Bench Milling Machine

A precision-engineered bench model milling machine made by the Benchmaster Manufacturing Company, 2952 West Pico boulevard, Los Angeles 6, Calif., is speedily and easily converted from a vertical to a conventional horizontal machine with overarm and arbor by simply interchanging the



Bench model milling machine

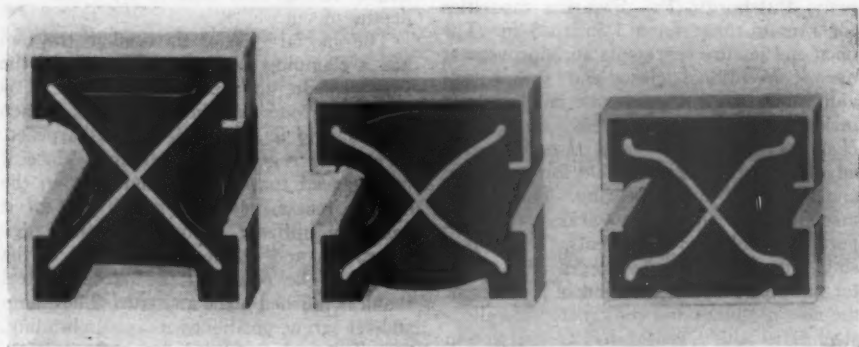
spindle attachments. In either position the Benchmaster mill is equally adapted to precision tool work, or high-speed production by equipping it with a rack and pinion feed in place of the hand feed. A variety of jobs such as precision die making, die sinking, slotting, facing, side milling, key seating, jig boring, angle slotting, etc., can be handled without tying up a large machine.

Features of the design are the ball thrust bearings on the vertical lead screw; gib locks on the table, a saddle and knee for insuring accuracy once the machine is set up; and an equalized weight distribution that provides rigidity enough to do heavy work accurately yet allows for great ease of handling.

The horizontal mill includes an overarm attachment for outboard support for the end of the arbor. The vertical mill attachment features a spindle arm which swings 60 deg. each side of center, graduated in degrees.

## Vibration Mount

Rexon, a new type of vibration mount, characterized by simplicity in design and application, and by virtual indestructibility in use, has just been announced by Hamilton Kent Manufacturing Company, a unit



Left: Vibration mount unloaded—Center: Under normal load—Right: Overloaded

of U. S. Stoneware, Akron, Ohio. Only two standard types of mountings are required to isolate vibration effectively. All that an engineer need know is the total weight, the weight distribution of the machine to be insulated, and whether the direction of the vibration is vertical or horizontal. Loading is not critical, a tolerance of plus or minus 10 per cent in computing machine weight or weight distribution is permissible.

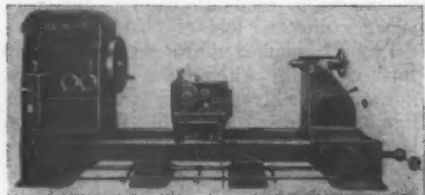
Rexon utilizes the vibration-dampening properties of rubber in shear. The shear elements cannot be overloaded. This property comes from the use of a special X-type design of the rubber element which acts in shear at the points of the X under normal loading, but in compression when the load exceeds the rated capacity of the mount. The mounts cannot be damaged by temporary or permanent overload. No rubber-to-metal bonds, either mechanical or chemical are used.

The internal dampening characteristics of the mounts virtually eliminate any problem of resonance as they have no critical frequency points. The mounts can be easily

and quickly installed without use of special angles, brackets or radius rods, and without increasing the overall height of a machine more than 1½ to 2 in.

## Armature Banding Machine

An armature banding machine called the extra heavy duty type H Peerless is now being made by the Electric Service Manufacturing Company, Philadelphia, Pa. It



Peerless heavy-duty type HL armature banding machine

is designed exclusively for banding armatures and particularly those that are too large to be handled by the types H and EH machines made by this company. This machine also incorporates a speed control which offers a large number of speeds com-

bined with a swing of 55 in. diameter and a length between centers of 72 to 96 in. and a torque capacity of 12,000 lb.

The bed consists of heavy iron channels connected by iron castings and supported on cast-iron pedestals. The bed is completely machined on the outside, giving an accurate surface for the carriage travel.

The headstock consists of a variable-speed transmission mounted on a rugged iron casting in which is supported the main spindle, clutch, brake shaft and worm shaft. The main spindle is mounted on Timken roller bearings, the clutch and brake shaft on ball bearings. The casting also encloses the main drive motor which is mounted on a pivoted base to allow for belt take-up.

A multiple V-belt drive transmits power from the main motor to the constant-speed shaft of the transmission and a silent-chain drive upon the variable-speed shaft of the transmission to the clutch shaft. The clutch and brake shaft and the worm shaft operate in oil. The main spindle is fitted with a No. 5 taper center and 24-in. diameter plate.



## Hard-Facing Alloy

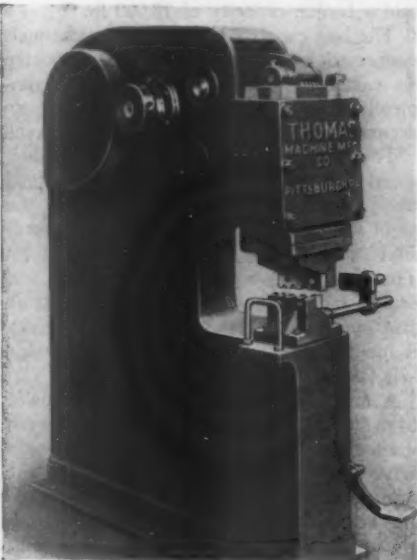
A non-ferrous hard-facing metal has been placed on the market by the Fansteel Metallurgical Corporation, North Chicago, Ill., under the name Fanweld. The metal is intended for acetylene torch application to steel, and possesses marked resistance to abrasion, heat, impact and erosion.

This metal contains tantalum-columbium carbide which is said to impart a peculiarly self-lubricating action, minimizing the destructive effects of friction even at elevated temperatures. Tests indicate that it is unusually well suited for hot-work punches, dies and tools.

Properly applied the metal "wets" steel surfaces readily without the use of a flux, flowing smoothly and evenly. Surfaces as thin as .010 in. can be applied with a fusion layer as thin as .0005 in. No hardening or heat treating operations are necessary. Fanweld is made in  $\frac{3}{16}$  in. and  $\frac{1}{4}$  in. diameter rods in 14 in. lengths.

## Open-End Bar Shears

A line of open-end vertical bar shears, designed in 10 sizes and with ram pressures of from 25 to 300 tons, has been announced by Thomas Machine Manufacturing Company, Pittsburgh, Pa. Shearing capacities for rounds range from 1 in. to 3 in. The open-end feature represents an improvement over conventional closed-end shears, enabling quicker, more accurate handling and making the shear blades easy to see and change. The new shears also have the advantage of being adaptable for punching, and plate and angle shearing. The ram is machined for attaching various types of punching-tool arrangements, including single, double- or triple-gagged units, cluster punches or a floating punch. Frames of the new machines and constructed of rolled-steel plate with a heavy-steel throat section welded into place. The multiple-jaw clutch has a positive automatic kickout for stopping the ram at the top of the stroke. The flywheel is mounted in roller bearings lo-

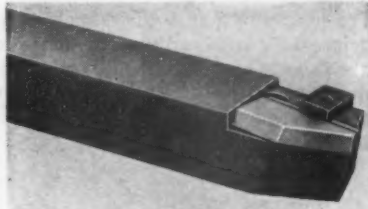


Open-end vertical bar shear

cated within the frame for safety and to eliminate overhung load on the bearings. A V-belt motor drive provides quiet operation and reduces shock load on the motor.

## Tool Tips Clamped in Holder

Kennametal, Inc., of Latrobe, Pa., is now producing a line of tools having clamped-in and advanceable Kennametal tips, for heavy-duty machining on steel castings, forgings, bar stock and cast iron. The design has been



Tool tips in this holder can be advanced to compensate for wear until major portion of the tip is worn away

made possible by the development of heavy-duty Kennametal tips, that, while overhanging the tool shank by about  $\frac{1}{16}$  in., have ample strength to take heavy feeds and depths of cut.

The special type of tip used in the tool has a clamping shelf along the top of the side opposite to the cutting edge. It is diamond ground on the under side. When dull, the tip is advanced, and resharpened. It may be reground many times, since it is advanced to the front and side, in the oblique recess, until the major part of it has been utilized. Only the cutting edge is ground, and no steel is removed in the process. The recess in the hardened-steel shank is finished plane and true. The clamp and set screw, positioned to avoid abrading, permit smooth, unimpeded chip flow.

Use of these tools permits carrying minimum tool stocks, since one shank serves for the life of many tips, and the proper grade of tip can be used for each job. Heavy-duty Kennametal tips are available in Grades KM and K3H for general steel cutting, Grade K2S for machining steel castings where scale is encountered, and Grade K6 for cast irons. The tools are made in several styles in the larger sizes with shanks 1 in. wide, or more.

## Tipping Carbide Tools

Tools tipped with carbide and high-speed steel are generally prepared by preplacing a strip of brazing alloy, together with a sufficient amount of flux, between the tip and the shank. The assembly is then placed in a furnace, or heated with an induction coil. This procedure, however, is sometimes objectionable, as the foil may become tarnished or oxidized and then require a temperature considerably above its own melting point to flow freely. Alloys in powder form present definite advantages over the use

of silver brazing alloys in the form of foil and the Eutectic Welding Alloys Co., New York, has developed two silver-copper and one copper alloy used for tipping tungsten-carbide and high-speed-steel tools which are now available in a fine powder. The required flux is mixed with the powdered alloy, which eliminates any waste of flux during preparation. Nor does the powder require the special handling necessary for cutting the foil into small pieces for exact pre-placing. The alloys and furnace temperatures which they require are:

EutecRod 1800 (lowest-melting) for high-speed steel, deg. F.	940-1,140
EutecRod 1601 (high-tensile) for tungsten carbide, deg. F.	1,020-1,250
EutecRod 16 (heat-resistant, for tungsten high-tensile) carbide, deg. F.	1,300-1,750

After customary degreasing and grinding, the powdered alloy is spread on the surfaces to be joined, and the tungsten-carbide tip is placed on top. The assembly is then heated until the alloy melts. The metal flows freely at a very slight increase in temperature above the melting point since the weld metal is pulverized. Oxidation of the tungsten carbide is prevented, as each particle of molten alloy immediately "tins" and adheres to the surfaces being joined.

## Indicating Control Instruments

The Bristol Company, Waterbury, Conn., has announced the development of a new series of indicating air-operated control instruments. The instruments, known as the model 93 series, are built for controlling temperature, pressure, vacuum, liquid level, and humidity. They operate on the free-vane principle of automatic control. They have a throttling range of from  $\frac{1}{2}$  to 15 per cent with the adjusting mechanism arranged so that changes in the throttling range can be made by the user without the need of tools. Being direct set instruments they can be set to control at any value within the range of the instru-



Bristol model 93 indicating air-operated control instrument

ment by turning the control pointer to the desired value. They are built so that they can be changed by a finger adjustment from reverse to direct action or vice-versa.

Typical applications are the control of temperatures in ovens, cookers, retorts, plating tanks, and soft-metal pots and the control of steam pressure, pressure in retorts, and back pressure.



# NEWS

## W. B. Holton Elected President Valve Manufacturers Assn.

W. B. HOLTON, JR., president of the Walworth Company, has been elected president of the Valve Manufacturers Association to succeed Ernest Cochran, vice-president of the Chapman Valve Manufacturing Company.

## Samuel C. Prest

SAMUEL C. PREST, who has been appointed engineer of tests of the Association of Manufacturers of Chilled Car Wheels with offices at Chicago, as noted in the March issue, entered the employ of the Griffin Wheel Company as an inspector in



Samuel C. Prest

1933 following his graduation from the University of Chicago. He subsequently became general inspector and served in that position until November, 1935. From 1935 to 1937 he was in the research department of the Association of Manufacturers of Chilled Car Wheels where he assisted in the development of the unit-pit type of annealing, now standard with the car wheel industry. He returned to the Griffin Wheel Company at the end of 1937 and until joining the Association of Manufacturers of Chilled Car Wheels, had been on the staff of the Cupola division, engaged in special work relating to cupola operations of Griffin plants. In addition he actively assisted in special studies being carried on by committees of the wheel association leading to changes in the design and specifications for the manufacture of chilled car wheels.

## Hearing on AB Brakes Set for April 17

UPON the request of the Association of American Railroads, a hearing on the Interstate Commerce Commission's No. 13528 proceedings, concerning the application of power brakes to freight cars, has been set for April 17 at the Morrison

Hotel, Chicago, before Commissioner Patterson. In making this announcement for the commission, Secretary W. P. Bartel added that the last day for filing briefs in this proceeding has been postponed from January 31 to a date yet to be fixed.

This hearing is the result of a show cause order served on the railroads on July 29, 1944, requiring returns to the proposal that installations complying with certain specifications made by the commission should be completed by January 1, 1946.

## Car Research Program Discussed at Purdue

THIRTY-four representatives of railway material suppliers, the Association of American Railroads, the American Railway Car Institute, and Purdue University met, at the invitation of Dean A. A. Potter, on March 7, 1945, at Lafayette, Ind., to discuss a program of research intended to furnish factual data useful in the design of modern railway cars. The discussions at this conference brought out the importance of utilizing recent developments in instrumentation and techniques to secure an accurate picture of the factors essential for the most effective utilization of different materials in modern freight car design, and of the desirability of tests on complete cars. It is expected that this conference will result in a research program of special interest to the railroads as well as to those who supply railway car materials.

## Second-Quarter Equipment Program Cut 30 Per Cent

By "slashing" the claims of the Office of Defense Transportation for second-quarter allocations of controlled materials for use in the production of civilian transportation equipment, the War Production Board has made the deepest cut in the O. D. T.'s quarterly program since the fall of 1943. This cut, which amounts to about 30 per cent on the basic carbon steel allocation, affects all civilian transportation agencies, for which the O. D. T. is the designated claimant agent, and particularly the railroads.

In explanation of the W. P. B. action, O. D. T. Director Johnson said it was due to the "heaviest military requirements for steel since the beginning of the war." The cut in allocations was a subject of discussion at the monthly meeting of the directors of the Association of American Railroads in Washington, D. C., February 23, at which time Colonel Johnson pointed out that the performance records made by the carriers in this war probably will have to be exceeded if they are to meet the greater demands that this year's traffic will make upon them.

The equipment program outlined by the O. D. T. called for an allocation of 1,527,000 tons of carbon steel in the second quarter of this year. The W. P. B. allowed

only 1,065,000 tons. The first quarter allotment was 1,254,838 tons.

The effect of this reduction in the allocation of carbon steel on the production of materials and equipment for railroad motive power and rolling stock was outlined by the O. D. T. as follows:

**Freight Cars.**—To provide for a planned quarterly production of 13,500 cars the O. D. T. has requested an allotment of 250,000 tons of carbon steel. This was cut to 135,000 tons, from which it is estimated 7,500 cars can be fabricated. The O. D. T. indicated that most of these will be box cars.

**Locomotives.**—Without detailing its program, the O. D. T. gave the second quarter carbon steel allocation as 30,000 tons.

**Passenger Cars.**—As previously announced, the O. D. T. program for the production of passenger cars in 1945 contemplated an output of 250 cars per quarter, and some materials were allocated by the W. P. B. for the first quarter schedule. For the second quarter, however, no steel was provided for passenger cars, as that phase of the program was disapproved entirely by the W. P. B., except that 252 tons was allotted for the production of 15 baggage and mail cars.

## Canadian Pacific Sets Up Research Department

WITH a view to meeting postwar competition through an intensive practical research into all matters of railway operation, the Canadian Pacific recently organ-



W. A. Newman

ized a new department of research, under the direction of W. A. Newman, who was for some years chief mechanical engineer of the railway. Since June, 1943, he has been on loan to Federal Aircraft, Ltd., and since October, 1944, has been in charge of the entire aircraft industry in Canada. It will be the duty of the research department to eliminate waste of effort and material, and so to develop and improve existing

facilities and services as to anticipate all contingencies.

In addition to his new position, with the Canadian Pacific, Mr. Newman will continue his war-time duties as aircraft controller of Wartime Industries and Control Board in the Department of Munitions and Supply, and as administrator for the Wartime Prices and Trade Board.

Mr. Newman joined the mechanical department of the Canadian Pacific 34 years ago as an apprentice in the Angus shops, following his graduation from Queen's University. He subsequently served as draftsman, supervisor of betterments, assistant mechanical engineer, locomotive construction engineer, and locomotive and car construction engineer until 1928 when he was appointed mechanical engineer.

### Veale Elected President of Pacific Railway Club

C. A. VEALE, vice-president and general manager of the Northwestern Pacific, was

elected president of the Pacific Railway Club at the twenty-eighth annual meeting of that organization, held in San Francisco, Calif., on March 8. Other officers elected were: W. T. Richardson, division engineer of the Western Pacific, vice-president; H. E. Jordan, superintendent of equipment of the Los Angeles Transit Lines, vice-president; H. R. Fegley, assistant to the general manager, Western Pacific, vice-president, and George C. Fish, superintendent, Union Pacific, vice-president. William S. Wollner was re-elected executive secretary of the club.

### Bureau of Safety Report

THE annual report of the Bureau of Safety, Interstate Commerce Commission, for the fiscal year ended June 30, 1944, is a 39-page document setting forth in the usual form the results of inspection of safety-appliance equipment on railroads together with information on hours-of-service records of employees, installations of signaling facilities, investigations of acci-

dents, and other activities of the bureau. The results of inspection of equipment are given as follows:

During the fiscal year a total of 1,456,317 cars and locomotives was inspected, and 44,204 or 3.03 per cent were found defective. That is the highest defective percentage of the 1935-1944 decade, the nearest approach being fiscal 1941's 2.91. The percentage for fiscal 1943 was 2.82. Included in the rolling stock inspected in fiscal 1944 were 33,669 passenger-train cars, of which 930 or 2.8 per cent were found defective, 1,268 defects being reported.

Air-brake tests were made on 3,870 trains, consisting of 170,473 cars, prepared for departure from terminals; and air brakes were found operative on 170,296 or 99.9 per cent of these cars. This percentage was attained, however, only after 1,907 cars having defective brakes had been set out, and repairs had been made to the brakes on 1,881 cars remaining in the trains. Like its predecessors, the report emphasizes this situation, saying: "These trains had been prepared for departure; yet when afterward tested by our inspectors it was necessary to set out or to repair the brakes on an average of one car per train."

Similar tests on 1,812 trains arriving at terminals with 92,371 cars showed that the air brakes were operative on 98.19 per cent of the cars. Cars with inoperative brakes averaged approximately one per train, the same as in the preceding year.

Commenting on the program for equipment that the year brought an increase of 137,517 ping cars with AB brakes, the report notes in the number of cars thus fitted—42,844 of them being new cars. It also notes that "during 9½ years, or 95 per cent of the 10-year period allotted for making this improvement only 45.4 per cent of the freight cars in interchange service have been equipped with the present standard air-brake apparatus. Meantime, as the report further points out the commission on July 29, 1944, issued its order requiring the carriers to show cause why all freight cars should not be required to be equipped by January 1, 1946.

The bureau has continued its cooperation with the Association of American Railroads with respect to test of geared hand brakes. Thus far 12 types of vertical-wheel geared brakes have been certified as conforming to A. A. R. requirements; and final action on other than vertical-wheel types is pending. The A. A. R. has also certified five designs for metal running boards for freight cars.

Alleged violations of safety appliance laws in 284 cases comprising 803 counts were transmitted to United States attorneys during the year. The report's section on the bureau's accident-investigation work shows that 102 accidents were investigated during the year; in them 377 persons had been killed and 1,722 injured.

Responding to requests of proprietors or their agents, the bureau, during the year, examined plans and specifications and rendered opinions on 12 safety devices. Among these were six devices for prevention and detection of hot journals, and one safety guard for car wheels.

### Orders and Inquiries for New Equipment Placed Since the Closing of the March Issue

LOCOMOTIVE ORDERS			
Road	No. of locos.	Type of loco.	Builder
Chesapeake & Ohio	10	4-8-4	Lima Loco. Wks.
Chicago & Eastern Illinois	2 <sup>1</sup>	2,000-hp. Diesel-elec.	Electro-Motive
Chicago, Rock Island & Pacific	10 <sup>2</sup>	Steam	American Loco. Co.
Great Northern	6 <sup>3</sup>	2,700-hp. frt.	Electro-Motive
	6 <sup>4</sup>	1,000-hp. switchers	Electro-Motive
	3 <sup>5</sup>	1,350-hp. A units	Electro-Motive
	10 <sup>6</sup>	1,000-hp. road and switching	Electro-Motive
Pennsylvania	25	4-4-4	Baldwin Loco. Wks.
	25	4-4-4	Co. shops
FREIGHT-CAR ORDERS			
Road	No. of cars	Type of car	Builder
Chicago, Milwaukee, St. Paul & Pacific	1,000 <sup>7</sup>	50-ton box	Co. shops
Donora Southern	50	70-ton hopper	American Car & Fdy.
LOCOMOTIVE INQUIRIES			
Missouri Pacific	4 <sup>8</sup>	4,000-hp. Diesel-elec.	
Texas & Pacific	3 <sup>9</sup>	2,000-hp. Diesel-elec.	
Great Northern	500 <sup>6</sup>	Box	Co. shops
Pennsylvania	500	50-ton box	Co. shops
PASSENGER-CAR ORDERS			
Road	No. of cars	Type of car	Builder
Central of Georgia	1 <sup>1</sup>	Pass-bagg.	Edw. G. Budd
	2 <sup>2</sup>	Coaches	Edw. G. Budd
	1 <sup>3</sup>	Observation-lounge	Edw. G. Budd
Chicago & Eastern Illinois	10 <sup>4</sup>		Pullman-Standard
PASSENGER-CAR INQUIRIES			
Pennsylvania	48 <sup>5</sup>		
Richmond, Fredericksburg & Potomac			
Seaboard Air Line			
Missouri Pacific			
	32	Sleeping	
	2	Sleeper-lounges	
	2	Diners	
	5	Diner-lounge	
	21	Coaches	
	8	Exp.-bagg.-mail	
Texas & Pacific			

<sup>1</sup> For two new streamline trains. Cars to include one diner and one lunch car. Delivery of the cars dependent upon W. P. B. authorization of their construction. Trains for service between Chicago and Evansville, Ind., and between Chicago and Thebes, Ill.

<sup>2</sup> Authorization received from Federal Judge. Total cost \$2,000,000. Ten similar locomotives were purchased last May, but increased traffic demands necessitated purchase of 10 additional units.

<sup>3</sup> For delivery this year.

<sup>4</sup> For delivery in first quarter of 1946.

<sup>5</sup> Order unconfirmed.

<sup>6</sup> Materials ordered for the construction of these cars during fourth quarter 1945. 1,000 plywood cars now completed.

<sup>7</sup> Authority granted by Federal Court for southern district of Georgia. The four cars will be streamlined, of stainless-steel construction, and air-conditioned. The 2,000-hp. Diesel-electric locomotive has been purchased from Electro-Motive.

<sup>8</sup> Bids closed March 16. Cost of the cars, to be constructed of light alloy, high-tensile steel framing with stainless-steel sheathing, is estimated at \$3,840,000 or about \$80,000 per car. The Seaboard and Pennsylvania will purchase 40 of the cars and the R. F. & P. the remaining eight. Acceptance of a bid for the Seaboard's share is contingent upon court approval of the proposed contract. The Seaboard plans to use the new coaches between New York and Florida and between New York and Birmingham, Ala. Between Richmond, Va., and Washington, D. C., the Seaboard uses R., F. & P. tracks and between Washington and New York, Pennsylvania tracks. The eight cars to be ordered by the R. F. & P. are the first of 19 authorized by the road's directors for postwar use.

<sup>9</sup> Purchase of equipment by Missouri Pacific authorized by Federal Judge at St. Louis, Mo.; purchase of equipment by Texas & Pacific approved by company's directors. According to Missouri Pacific statement, the equipment, which will comprise four trains for over-night service from St. Louis to many of the principal points in Texas, will cost \$9,000,000. Orders are to be placed in the near future in order to insure earliest possible delivery dependent upon allocation of now critical materials by the War Production Board.



## THE 7 RIGID TESTS THAT GUARANTEE UNIFORMITY

1. Chill test block taken at least once in every ten wheels poured.
2. One complete chemical analysis with each heat.
3. Constant pyrometer check to accurate processing temperature.
4. Drawings of wheels to specifications.
5. Thermal test of chilled wheel (see Specifications).
6. Test for Roundness.
7. Brinell Hardness test for maximum and minimum chill limits.

they all add up to  
**UNIFORM WHEELS**

• These seven tests translate an aim into an accomplishment. As a firmly-established part of the AMCCW Code of Practice, they assure all railroads of chilled car wheels which are uniformly good.

One by one, in previous advertisements, we have pointed out the purposes of individual tests . . . emphasized the thoroughness with which they are carried out . . . mentioned some of the fields such as optical pyrometry and micro-photography which have contributed to this thoroughness.

This series of tests illustrates the high standards to which our member manufacturers subscribe and to which they must adhere in order to remain members. The end-result of such adherence is product uniformity — a practical aid to today's railroads in the great wartime job they are doing.



**ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS**  
230 PARK AVENUE, NEW YORK, N. Y. • 445 NORTH SACRAMENTO BOULEVARD, CHICAGO, ILL.  
Organized to achieve: Uniform specifications — Uniform inspection — Uniform product





**LIMA LOCOMOTIVE**

RAILWAY MECHANICAL ENGINEER

Supply Trade Notes

THE



was ready!

Realizing the tremendous role that coal plays in modern warfare, the Chesapeake & Ohio had the foresight to plan far in advance for motive power to handle the vastly increased tonnage of coal which must be speeded over its lines.

Five years ago the C & O ordered ten 2-6-6-6 Lima Locomotives, specially designed to haul heavy trains over the steep grades of the Allegheny Mountains. This fleet has been steadily augmented until forty-five of these "Allegheny" type giants are now moving the coal so vital to the successful carrying on of the war.

High efficiency and low maintenance costs are two outstanding features of this locomotive.

**WORKS, INCORPORATED** LIMA, OHIO

## Supply Trade Notes

**MORRISON RAILWAY SUPPLY CORPORATION.**—The Morrison Railway Supply Corporation has moved its Chicago office to 322 South Michigan avenue.

**PARKER-KALON CORPORATION.**—S. S. Kahn, assistant sales manager, has been appointed sales and advertising manager of the Parker-Kalon Corporation, New York, to succeed the late Charles S. Trott.

**WARREN TOOL COMPANY.**—Karl F. Baumann, assistant to the vice-president in charge of sales of Globe-Union, Inc., has been appointed assistant sales manager of the Warren Tool Corporation.

**FLANNERY BOLT COMPANY.**—W. B. Peirce has been appointed vice-president of research and development of the Flannery Bolt Company, Bridgeville, Pa. Dr. G. R. Greenslade has been appointed director of research; F. K. Landgraf, vice-president of engineering, and W. C. Masters, sales manager.

W. B. Peirce served his apprenticeship with the Baldwin Locomotive Works, and later was night superintendent. He then became general superintendent of the Buf-



W. B. Peirce

falo Bolt Company at North Tonawanda, N. Y. Shortly after the last war he was appointed works manager of the Graham Bolt & Nut Co., at the time Jones & Laughlin made an investment there for the purpose of expanding the Graham Company's activities. He continued with the Pittsburgh Screw & Bolt Corp. after their absorption of the Graham Bolt & Nut Co., subsequently transferring to the Flannery Bolt Company as works manager.

Dr. G. R. Greenslade is a graduate of Whitman College, Washington University and Wisconsin University, and holds the degrees of bachelor of science, master of science, master of arts and doctor of philosophy. He was formerly fellow of the department of physics at Wisconsin University. During the first world war he served as director of the school of elec-

tronics and radio communication at the Madison, Wis., cantonment. He has taught physics and engineering subjects at four colleges and universities; was in charge of the research problem of diffusivity and con-



G. R. Greenslade

ductivity as related to the diurnal heat cycle of the Holland vehicular tunnels between New York and New Jersey; and has collaborated with the U. S. Bureau of Standards and the laboratories of the General Electric Company. He also served with the U. S. Bureau of Mines as chief of the physics section of the Pittsburgh, Pa., station, and later for two years as consulting physicist. Dr. Greenslade has been in the employ of the Flannery Bolt Company for some years, serving as chief physicist and as research engineer. He has received over fifty United States and foreign patents on his inventions.



F. K. Landgraf

F. K. Landgraf is a graduate of Wisconsin University. In the interests of James J. Flannery Mr. Landgraf went to Pittsburgh in 1903 as mechanical engineer for the American Vanadium Company. He became associated with Flannery Bolt Company upon its formation in 1904 as a draftsman and later served as superintendent, general superintendent and chief engineer. He

has designed and built many of the machines used in the production of the company's wartime and commercial products and has contributed towards the many patents which the company owns covering these devices.

W. C. Masters received his education at the Carnegie Institute of Technology. He has been active in the operation of several plants and more lately has specialized in the technical and metallurgical aspects of the business. He was loaned by the Graham Bolt & Nut Company for a period of years to the Bolt, Nut and Rivet Institute, serving as technical advisor. He was sales



W. C. Masters

engineer in the employ of the Townsend Company for a short time and, in 1936, joined the Flannery organization.

**LINCOLN ELECTRIC COMPANY.**—W. R. Persons has been appointed assistant sales manager of the Lincoln Electric Company, Cleveland, Ohio. Mr. Persons has been with the company for the past ten years. He is a graduate of the Case School of Applied Science. He took the Lincoln Electric Company's welding course and subsequently was assigned to the position of sales and service representative in western Pennsylvania. He was appointed branch manager of the company's Pittsburgh, Pa., office four years later, and in 1944 was transferred to the home office at Cleveland, where he worked on special assignments. Mr. Persons is chairman of the company's junior board of directors.

**INLAND STEEL COMPANY.**—The Inland Steel Company, Chicago, has established a metallurgical and inspection department by merging the activities of its Indiana Harbor works metallurgical department, its Indiana Harbor works inspection department, and its general office department of inspection and metallurgy. The purpose of the consolidation is to effect a unified control over all of the metallurgical and inspection services of the company and to obtain more complete correlation of these activities. J.

(Continued on next left-hand page)



# THE FRANKLIN SYSTEM OF STEAM DISTRIBUTION

*The Outstanding  
Development  
in Locomotive Design*

The Franklin System of Steam Distribution has  
eliminated the restriction on power output imposed  
by conventional systems of steam distribution.



**FRANKLIN RAILWAY SUPPLY COMPANY, INC.**

NEW YORK • CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

**Hunter Nead**, chief metallurgist, has been appointed manager of the new department, with headquarters at Indiana Harbor, Ind., while **E. D. Martin** and **T. S. Washburn** have been appointed assistant managers at the Indiana Harbor works and the general office in Chicago, respectively. **L. S. Marsh**, manager of the general office department inspection and metallurgy, will continue in a special metallurgical advisory and consulting capacity.

**THOMAS MACHINE MANUFACTURING COMPANY.**—The Thomas Machine Manufacturing Company, Pittsburgh, Pa., has announced the appointment of sales agencies in 16 major cities to handle Thomas equipment for all of the United States east of the Mississippi river. Similar agencies for territory west of the Mississippi will be announced shortly. The new agents are: the *General Machinery Corporation*, Boston, Mass.; *Giebel, Inc.*, New York and New Haven, Conn.; the *C. H. Briggs Machine Tool Co.*, Syracuse, N. Y.; *W. W. Wentz*, Rochester, N. Y.; the *J. L. Osgood Machinery & Tool Co.*, Buffalo, N. Y.; the *L. A. Benson Company*, Baltimore, Md.; the *Smith Courtney Company*, Richmond, Va.; the *Chandler Machinery Co.*, Atlanta, Ga.; the *George D. Miller Company*, Cleveland, Ohio; the *Brokaw Machinery Co.*, Cincinnati, Ohio; *Joseph Monahan*, Grand Rapids, Mich.; the *Bryant Machinery & Engineering Co.*, Chicago; *Quinn & Quinn*, Birmingham, Ala.; the *Noland Company*, Chattanooga, Tenn.; and *Frederic & Baker*, Shreveport and New Orleans, La.

**WESTINGHOUSE AIR BRAKE COMPANY.**—**G. L. Cotter**, western district engineer, has been appointed assistant manager of the western district, with headquarters at Chicago. Mr. Cotter is a graduate of Michigan University with a degree in mechanical engineering. He joined the Westinghouse Air Brake Company at Wilmerding, Pa., in 1923, and after serving in the test and engineering divisions, was appointed district engineer for the central district, Pittsburgh, Pa., and, in 1940, head of the commercial engineering division in Wilmerding. He was transferred to Chicago as western district engineer in 1943.

**W. V. WALKINSHAW** has been appointed manager of industrial sales, with headquarters at the company's general office at Wilmerding, Pa., to succeed the late Roland G. Justus.

**BENDIX AVIATION CORPORATION.**—**Arthur C. Omberg** has been appointed chief research engineer of the Bendix Radio division of the Bendix Aviation Corporation, and **Dr. Harold Goldberg**, formerly senior engineer of the Stromberg-Carlson Company, has been appointed a research engineer on the Bendix Radio staff.

**AMERICAN STEEL & WIRE COMPANY.**—**Harold Martin** has been appointed assistant manager of New England sales by the American Steel & Wire Co., U. S. Steel subsidiary. He will continue to be located in the Boston, Mass., sales office where he has been manager of merchant product sales since March, 1942.

**COPPERWELD STEEL COMPANY.**—**Louis McGuire**, formerly manager and operating superintendent of an electric system in Tennessee, has been appointed sales engineer for the Copperweld Steel Company, Glassport, Pa., to cover the states of Tennessee, Mississippi and Alabama. Mr. McGuire will make his headquarters in Birmingham, Ala., and will be under the jurisdiction of Copperweld's Memphis, Tenn., office.

**GOULD STORAGE BATTERY COMPANY.**—**Richard A. Rowland** has been elected vice-president of the Gould Storage Battery Corporation (the Gould Industrial division of the National Battery Company), with headquarters at Depew, N. Y. He succeeds **H. G. Barnes**, whose promotion to vice-president in charge of sales of the parent organization was reported in the March issue. Prior to his new connection Mr.



**Richard A. Rowland**

Rowland was vice-president of the Saint Paul Engineering and Manufacturing Company, St. Paul, Minn.

**LUKENS STEEL COMPANY.**—**Edward J. Charlton**, who since 1942 has been assistant to the president of Lukenweld, Inc., has been appointed manager, development engineering, for the Lukens Steel Company and its subsidiaries, By-Products Steel Corporation and Lukenweld, Inc. Mr. Charlton was born in Philadelphia, Pa., where he attended high school and the Drexel Institute of Technology. Upon graduation from Drexel he entered the employ of Shepard Niles Crane and Hoist Company. In 1931 he joined the engineering staff of Lukenweld as a designing engineer, and in 1940 became general manager of Lukenweld, Inc. Mr. Charlton is a member of the American Society of Mechanical Engineers, the American Welding Society, and the American Society of Naval Engineers.

### Army-Navy "E" Awards

*Clark Equipment Company*, Buchanan, Mich. January 31.

*Greenfield Tap & Die Corporation*, Greenfield, Mass. Fifth award.

*Heywood-Wakefield Company*, Gardiner, Mass. Fourth award.

*Sterling Engine Company*, Buffalo, N. Y. Fourth award.

**TEXAS COMPANY.**—The following changes have been announced in the railway sales division of the Texas Company: **J. M. P. McCraven**, from district manager at Chicago to assistant manager at New York; **John B. Flynn**, from district manager to assistant manager at New York; **A. W. Larsen**, from assistant district manager at St. Louis, Mo., to district manager at Chicago; **C. H. Weisel**, from assistant district manager to district manager at New York; **R. W. Woods**, from representative to assistant district manager at New York; and **W. E. Wilcox**, from lubrication engineer, at Roanoke, Va., to assistant district manager at St. Louis.

**OAKITE PRODUCTS, INC.**—**Dr. Donald Price** has been appointed Technical Director of Oakite Products, Inc. Dr. Price will direct the activities of Oakite's engineering and chemical staff, including its Research Laboratory and Technical Service Department. He is vice-president of the American Institute of Chemists, councilor of American Chemical Society, member of the Executive Committee, American Branch, American Institute of Chemists, and various other professional societies.

**UNITED STATES STEEL CORPORATION OF DELAWARE.**—**L. M. Parsons**, formerly vice-president and general manager of sales of the Jones and Laughlin Steel Corporation, has been appointed assistant to vice-president-sales of the United States Steel Corporation of Delaware with headquarters in Washington. Mr. Parsons was born in Philadelphia, Pa., in 1898. After graduating from the University of Pennsylvania he entered the employ of the Bethlehem Steel Company in 1919 and in 1936 he became district manager of sales at Philadelphia. He became vice-president and general manager of sales of the Jones and Laughlin Steel Corporation in 1938.

**WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.**—**Gwilym A. Price** of Pittsburgh, Pa., a vice-president, and **John R. Read** of Hamilton, Ont., chairman and president of the Canadian Westinghouse Company, have been elected directors of the Westinghouse Electric & Manufacturing Company. **L. G. Burwinkel**, assistant to the central district manager, has been appointed assistant to the vice-president and sales manager. Mr. Burwinkel joined the Westinghouse Company in Cincinnati, Ohio, in 1924, and served in various accounting and sales positions until 1938 when he was transferred to Pittsburgh, Pa., as central district auditor and district superintendent. He was appointed assistant to the central district manager in 1940.

**R. K. LeBLOND MACHINE TOOL COMPANY.**—The *Ford Machinery Company* of Toledo, Ohio, has been appointed agent in the Toledo Territory for the R. K. LeBlond Machine Tool Company of Cincinnati, Ohio. The *Calco Machinery Company*, Philadelphia, Pa., agent for LeBlond in the District of Columbia, Delaware, Maryland, southern New Jersey, and eastern

(Continued on second left-hand page)



# 34 RAILROADS

improve locomotive performance

by the use of...

## SECURITY CIRCULATORS

THESE railroads have installed Security Circulators in their locomotives not only for boiler protection, but to increase locomotive availability and to decrease maintenance.

Security Circulators give these results —

By assuring a positive flow of water over the center of the crown sheet at all times,

By forming an ideal support for arch brick, permitting the use of a 100% arch and promoting better combustion,

By reducing honeycombing, flue plugging and cinder cutting, and by increasing the life of arch brick.

During the last eleven years over fifty-three hundred Security Circulators have been ordered by these railroads.

### AMERICAN ARCH COMPANY, Inc.

NEW YORK • CHICAGO

SECURITY CIRCULATOR DIVISION



IT'S A GREAT NEW DAY FOR RAILROADING

# PAGE CASEY JONES

and find out what he would have thought  
about the safety and comfort  
of driving a  
General Motors locomotive.

**GENERAL MOTORS**  
**LOCOMOTIVES**

IT'S A GREAT NEW DAY FOR RAILROADING

Full vision ahead and on either side  
for a clear view of  
tracks and signals—  
no steam, smoke or cinders  
to obstruct sight.



He might not believe you.  
But he could be shown.

ON TO FINAL VICTORY ★ BUY MORE WAR BONDS

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS CORPORATION

LA GRANGE, ILL.

Pennsylvania, has been appointed also to represent the Carlton Machine Tool Company in the same territory. *Nick Koppi*, formerly of the LeBlond sales and service department, has been appointed manager of the Calco Machinery Company.

**WILKENING MANUFACTURING COMPANY.**—*Helmuth G. Braendel* has been appointed chief engineer of the Wilkening Manufacturing Company, Philadelphia, Pa. For the past three years Mr. Braendel has been assistant and then chief development engineer for the Continental Motors Corporation, Detroit, Mich. Prior to that he was for seven years project engineer in the Engine Development Division of the Chrysler Corporation. He is a graduate of the Stevens Institute of Technology and of the Chrysler Institute of Engineering, with the degree of Master in Mechanical Engineering. Under an International Exchange Fellowship, Mr. Braendel studied advanced mechanical engineering and aeronautical engineering in European universities. He is a member of the Society of Automotive Engineers.

**DEARBORN CHEMICAL COMPANY.**—*George R. Carr*, chairman of the executive committee of the Dearborn Chemical Company, with headquarters at Chicago, has been elected chairman of the board of directors, succeeding Robert F. Carr, deceased.

**JOHNS-MANVILLE SALES CORPORATION.**—*Raymond P. Townsend* has been named vice-president of the Johns-Manville Sales Corporation and general sales manager of the company's transportation department. In his new position, Mr. Townsend will assist John H. Trent, vice-president and general manager, in directing sales of the transportation department throughout the United States and Canada.

Mr. Townsend began his career in the purchasing department of the New York Central and later served as purchasing agent of the Liberty Steel Products Company and railroad sales representative of the Murphy Varnish Company. He joined



Raymond P. Townsend

Johns-Manville in 1925 as sales manager of the eastern region and was appointed general sales manager of the transportation department in 1944.

**VAPOR CAR HEATING COMPANY.**—*A. D. Bruce* has been elected president of the Vapor Car Heating Company, Chicago, to



A. D. Bruce

succeed *W. L. Conwell*, who becomes chairman of the board. *L. H. Gillick* has been elected vice-president in charge of sales and *E. A. Russell*, vice-president in charge of research and engineering.

*Walter L. Conwell* was born in Covington, Ky., in 1877, and is a graduate of Pennsylvania University. He was employed as chief engineer at the Tennis Construction Company, railway contractors, in 1908-10, and as a salesman of the Westinghouse



W. L. Conwell

Electric & Manufacturing Co. in 1910-11. He was president of the Transportation Utilities Company from 1911 to 1916. He joined the Safety Car Heating & Lighting Company as assistant to the president in 1916 and was elected president of that company in 1919. He was elected president of the Vapor Car Heating Company, Chicago, and the Vapor Car Heating Company of Canada in November, 1928. Mr. Conwell is chairman of the board of the Pintsch Compressing Company, president and director of Safety Refrigeration, Inc., and Products Protection Corporation and a director of Overseas Railways, the Wilcolator Company, and the Carrier Corporation.

*Alexander D. Bruce* was born in Guelph, Ont., in 1887. His early employment was with a large carriage manufacturing plant and with the Standard Fitting & Valve Co. in Canada. In 1909 he entered the employ

of the Chicago Car Heating Company as storekeeper, and was successively purchasing agent and Canadian manager. In 1917, upon the organization of the Vapor Car Heating Company, he was elected its secretary. In 1926, Mr. Bruce was elected a director and vice-president and in November, 1940, executive vice-president.

*L. H. Gillick* was born at Minneapolis, Minn., on August 25, 1898, and after attending Northwestern University, entered the employ of the Chicago Car Heating Company, predecessor of the Vapor Car Heating Company, in January, 1916. After completing a period of training in the shops he was appointed inspector in the Chicago district. On September 1, 1920, he became Northwest representative of sales and



L. H. Gillick

service, with headquarters at St. Paul, Minn. In November, 1925, he was appointed assistant to the vice-president at Chicago, and in November, 1940, sales manager.

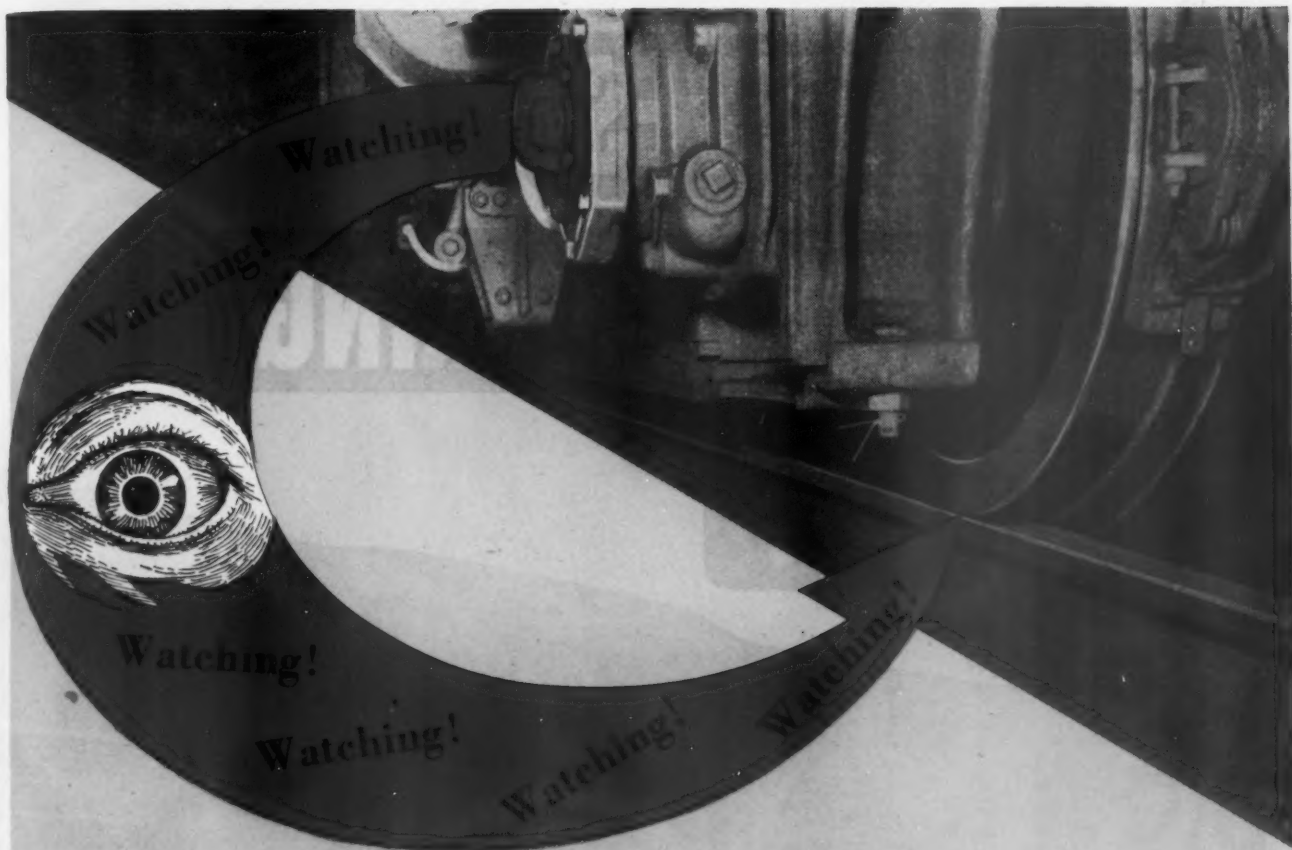
*Edward A. Russell* was born in Pennsylvania in 1887, and attended Crane Manual Training School in Chicago and the Armour Institute of Technology. After seven years on the Pennsylvania Railroad,



E. A. Russell

beginning as machinist apprentice, he was employed by the Chicago Car Heating Company as a draftsman in 1909. Successively, he has been chief draftsman, design engineer, research engineer, and chief engineer.





## On Guard



**Softens the Brake  
When Wheel Slip Impends**

**T**HE "AP" Decelostat keeps tab of the wheel whether moving forward or back. It rolls with the wheel and observes the slightest hesitation in wheel rotation when brakes are applied.

It maintains constant check on the rate of slow-down and is poised to act if this rate reaches a set limit.

And when this limit develops the Decelostat flashes the impulse to the brake cylinders—*softens the brake momentarily*, permitting the offending wheel to get into step with the others in the train.

**WESTINGHOUSE AIR BRAKE CO.**

**WILMERDING, PENNSYLVANIA**

# LOCOMOTIVES

# THAT ARE MAKING

# HISTORY



## ***Gentlemen, meet the new S-1***

**P**ERHAPS you know this locomotive, already. It is of special interest to the entire railroad world.

Why? The answer lies in a problem that is of major importance to management men on practically every American road...*the problem of handling traffic without excessive locomotive investment.*

The logical answer to this problem is to provide an efficient *dual-purpose* locomotive—one that can be used effectively both for fast passenger and fast freight hauls.

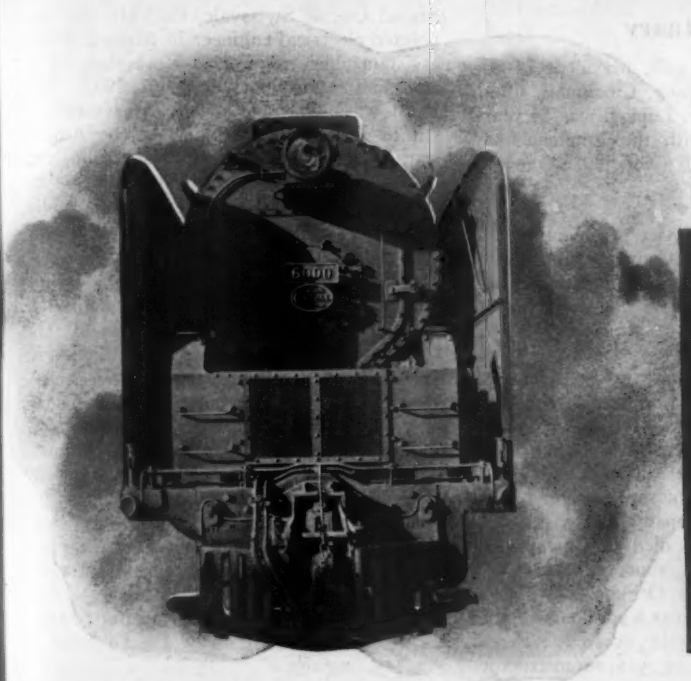
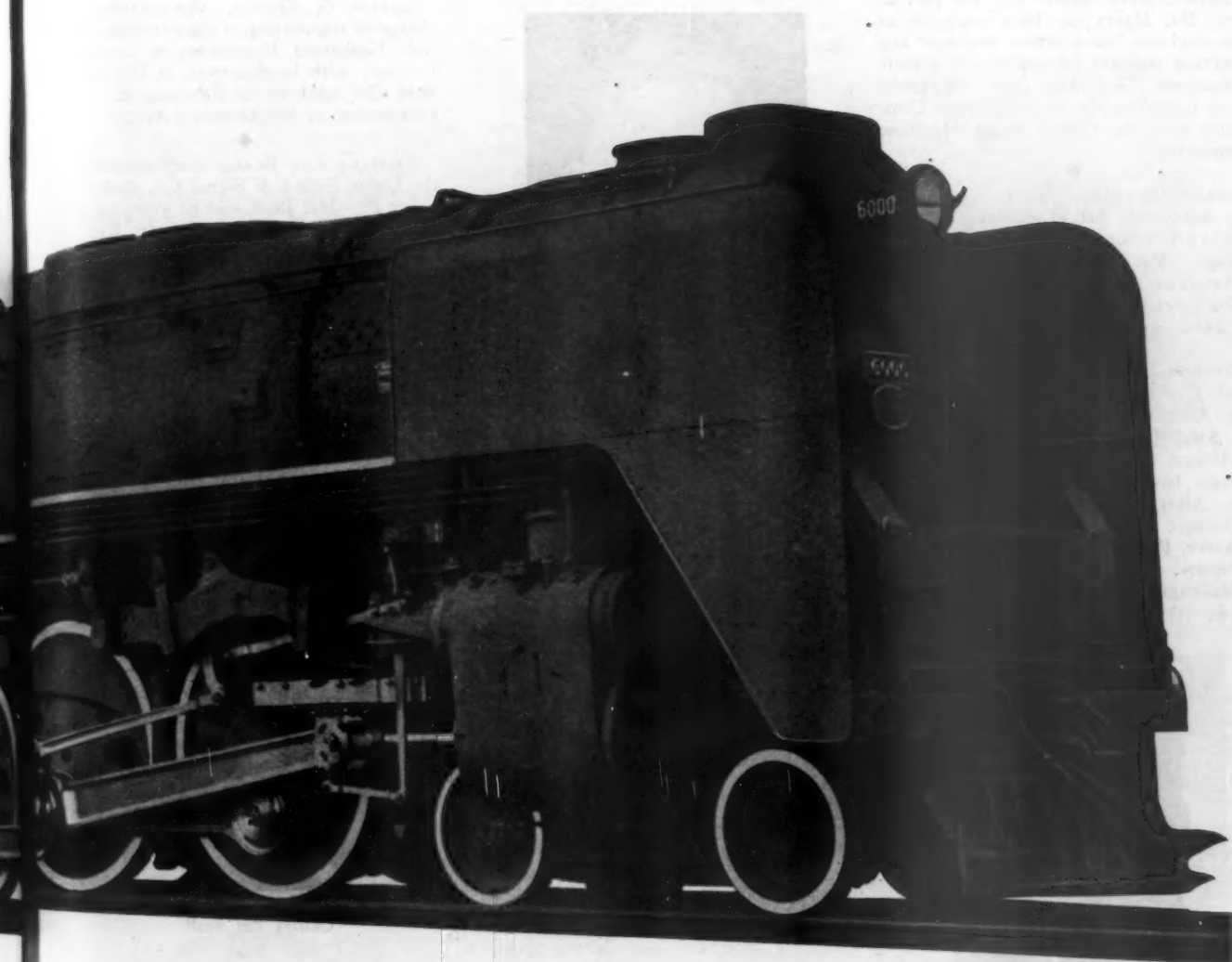
To meet this problem, American Locomotive Company, working with the New York Central System, has developed the locomotive shown

above—"The Niagara"—which is designed to combine speed and power.

This locomotive is the latest example of an important development made possible by close cooperation between American Locomotive and The New York Central—a development that helps reduce investment, operation and maintenance costs by reducing the total number of locomotives a railroad needs in order to do its job.

• • •

Locomotive designs developed by American Locomotive Company have been, are, and will continue to be powerful factors in American railroad-operating efficiency and economy.



# American Locomotive

NEW YORK



**COOPER-BESSEMER CORPORATION.**—Walter F. Myers has been appointed to the staff of the Washington, D. C., office of the Cooper-Bessemer Corporation to assist Charles G. Cooper, director of that office, in the handling and supervision of government contracts and sales and service in the southern Atlantic states. For the past 25 years, Mr. Myers has been employed as sales engineer, construction engineer and consulting engineer for public and private corporations, including the Fairbanks Morse Company, the Federal Power Commission and the United States Maritime Commission.

◆  
**SCIACKY BROTHERS.**—Robert Santini has been appointed district manager of the New York office of Sciacky Brothers of Chicago. Mr. Santini was until recently chief engineer delegated by Sciacky Brothers to the Specialty Equipment Company, former Sciacky representative in New York.

◆  
**CARNEGIE-ILLINOIS STEEL CORPORATION.**—Frank T. Bumbaugh, assistant manager of sales, Alloy division, of the Carnegie-Illinois Steel Corporation (a subsidiary of the United States Steel Corporation) at Chicago, has been appointed manager of sales, Alloy division, with headquarters at Chicago. Mr. Bumbaugh was born at Monessen, Pa., and is a graduate of Lehigh University. In 1926 he became a metallurgical engineer in the employ of Carnegie-Illinois, serving in the bar, semi-finished



Frank T. Bumbaugh

and alloy products division at Pittsburgh, Pa. In 1942 Mr. Bumbaugh was appointed assistant manager of sales.

◆  
**INTERNATIONAL NICKEL COMPANY.**—Frederick P. Huston has been placed in charge of railroad developments in the application of nickel alloy steels, cast irons, Monel and other nickel alloys, development and research division, International Nickel Company. Mr. Huston has been associated with the Inco mill products division since June, 1940, devoting considerable time to the problems of steam locomotive maintenance, particularly boilers and fireboxes. He is a graduate of the University of Missouri (1912) with a degree in electrical engineering. He joined the International Nickel Company in October, 1927, as technical service engineer in the development and research division. He is a member of

the general committee of the Metals Engineering Division and of the general committee of the Railroad Division, American Society of Mechanical Engineers, and a member of the staybolt committee of the Master Boiler Makers' Association.

Donald J. Reese, who has been with the



Frederick P. Huston

steel division of the War Production Board at Washington, D. C., since April, 1942, has resumed his duties with the development and research division of the International Nickel Company at New York.

◆  
**ALLIED RAILWAY EQUIPMENT COMPANY.**—Carl R. Moline, chief engineer of the Allied Railway Equipment Company, Chicago, has been elected vice-president, with headquarters at Chicago. He will continue as chief engineer.

◆  
**PITTSBURGH PLATE GLASS COMPANY; PACIFIC ALKALI COMPANY.**—The Columbia Chemical Division of the Pittsburgh Plate Glass Company has acquired the Pacific Alkali Company's Bartlett, Cal., plant and Los Angeles, Cal., sales office. A new district sales office has been opened at San Francisco, Cal.

## Obituary

**ESHELBY F. LUNKEN**, president of the Lunkenheimer Company, Cincinnati, Ohio, died January 25. Mr. Lunken was 54 years of age. He was with the Lunkenheimer Company for 35 years and had served as president for 26 years.

◆  
**W. A. KIRKWOOD**, vice-president of the Maryland Car Wheel Company, Baltimore, Md., died February 9. Mr. Kirkwood had been associated with the company for 36 years.

◆  
**ALBERT SYDNEY BONNER**, president of the Clark Equipment Company, Buchanan, Mich., died February 8. He was 53 years of age.

◆  
**DR. CHARLES F. BURGESS**, founder of the Burgess Battery Company and the C. F. Burgess Laboratories died in Chicago on February 13 after a short illness. Mr. Burgess was born in Oshkosh, Wis., on January 5, 1873, and was a graduate of the University of Wisconsin in 1895. From that year until 1900 he was an instructor

of electrical engineering and from 1900 to 1913, professor of electro-chemistry and chemical engineering. In 1917 he formed the Burgess Battery Company and served as its president until 1929 when he became chairman of the board.

◆  
**GARTH G. GILPIN**, vice-president in charge of engineering of the Standard Railway Equipment Manufacturing Company, Chicago, with headquarters at Hammond, Ind., died suddenly on February 25, while vacationing at Wickenburg, Ariz.

◆  
**CHARLES RAY BEALL**, chief engineer of the Union Switch & Signal Co., died February 24. Mr. Beall was 62 years of age. He was a graduate of Ohio State University in 1907 with the degrees of electrical engineer and mechanical engineer. He began his career in the engineering apprenticeship course of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh, Pa. After completing the course, he was transferred to the industrial section of the engineering department. In October, 1910, he joined the electrical engineering department of the Union Switch &



Charles Ray Beall

Signal Co., at Swissvale, Pa. He was appointed electrical engineer in August, 1916; assistant chief engineer in November, 1923, and chief engineer on January 1, 1937. Mr. Beall was a member of the American Institute of Electrical Engineers, the American Railway Engineering Association, the Institution of Railway Signal Engineers in England, and the Signal Section of A. A. R.

◆  
**BERTRAM B. QUILLEN**, president of the Cincinnati Planer Company and the Acme Machine Tool Company, died suddenly, February 26, at his home in Cincinnati, O. Mr. Quillen, together with William H. Burtner and George Langen, now vice-president of the Cincinnati Planer Company, founded that company in 1898. Mr. Quillen was born in Lebanon, Ind., August 1, 1869. After receiving his education in the Indiana schools, he entered business in Chicago, but shortly after came to Cincinnati where he began his career in the machine tool industry with Lodge and Davis Machine Tool Company, predecessor of the American Tool Works. Leaving Lodge and Davis, Mr. Quillen founded the Cincinnati Planer Company.

## Personal Mention

### General

H. W. PINKERTON, electrical and mechanical engineer of the Cleveland Union Terminal at Cleveland, Ohio, has retired after more than 38 years of service.

E. C. RICHARDS, assistant superintendent of equipment of the Michigan Central at Detroit, Mich., has retired after more than 46 years of service.

J. R. FROHOFF, who has been appointed superintendent of motive power and machinery, northwestern district, of the Union Pacific, with headquarters at Albina, Ore., as reported in the March issue, entered the service of the Union Pacific, in August, 1924, as a machinist at Junction City, Kan. In 1928 he became enginehouse foreman at Junction City and later served as general locomotive foreman, mechanical foreman, machine foreman and district foreman at various points. In August, 1938, he was appointed master mechanic at Kansas City, Mo.; in April, 1940, assistant to the superintendent of motive power and machinery at Omaha, Neb., and in August, 1940, master mechanic of the Colorado division, with headquarters at Denver, Colo.

GEORGE G. RITCHIE, who has been on furlough from the Chesapeake & Ohio for the past two years serving as a major in the United States Army, has returned to the C. & O. and has been appointed general fuel service engineer, with headquarters at Richmond, Va.

SAMUEL B. SCHENCK, assistant engineer, motive power of the Bessemer & Lake Erie at Greenville, Pa., has been appointed engineer, motive power. Mr. Schenck was born at Howard, Pa., on May 11, 1891. In



Samuel B. Schenck

1913 he entered the railway engineering department of the Westinghouse Electric & Manufacturing Company, doing electric traction work, and later became a general railway engineer specializing in gasoline and Diesel-electric locomotives and rail cars. During the first world war he served as a second lieutenant of engineers in the office of the director-general of military railways at Washington, D. C. Mr. Schenck

entered the service of the Bessemer & Lake Erie in 1934 as special engineer in the mechanical department, working with Diesel locomotives, train communication and on special assignments. He was appointed assistant engineer of motive power on March 1, 1944.

GEORGE H. POLLARD, who has been appointed mechanical engineer of the Missouri Pacific, with headquarters at Palestine, Tex., as reported in the March issue, was born at Moberly, Mo., on July 5, 1894, and was educated at Washington University, Jefferson College, and the North St.



George H. Pollard

Louis Drafting and Engineering School. He entered railway service on June 16, 1920, as a general draftsman in the office of the mechanical engineer of the Missouri Pacific at St. Louis. Later Mr. Pollard became shop draftsman, where he remained until his transfer to Palestine as mechanical engineer.

J. J. DALY, who has been appointed superintendent of motive power and machinery of the Union Pacific, with headquarters at Omaha, Neb., as announced in the March issue, entered the service of the U. P. in 1921 as a machinist apprentice at Laramie, Wyo. He later served in several minor positions at Cheyenne, Wyo., Green River, Ogden, Utah, and Council Bluffs, Iowa, until April, 1942, when he became master mechanic at Council Bluffs. In 1943 he was appointed assistant superintendent of shops at Omaha, and in 1944 was appointed master mechanic of the Nebraska division, with headquarters at Omaha.

### Military Awards and Citations

#### DISTINGUISHED SERVICE MEDAL

BRIG. GEN. CARL R. GRAY, Jr., director general, 1st Military Railway Service in Italy and France. For "exceptionally meritorious service to the government in a duty of great responsibility in Italy and southern France." General Gray also holds the Legion of Merit medal and the citation from the Italian Government mentioned on page 141 of the March issue.

ROY C. BEAVER, engineer, motive power, of the Bessemer & Lake Erie at Greenville, Pa., has been appointed superintendent of



Roy C. Beaver

motive power, with headquarters at Greenville. Mr. Beaver was born at Greenville on August 29, 1889, and is a graduate of Thiel College (1913). He entered the service of the B. & L. E. in 1913 as a mechanical draftsman and in 1918, was appointed assistant mechanical engineer. In 1933, he assumed special duties in the car department on the development of lightweight cars; in 1939 became assistant engineer, motive power, and in March, 1944, engineer, motive power.

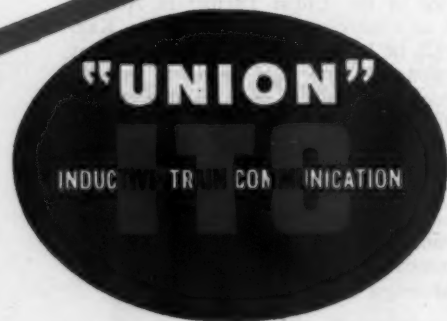
D. S. NEUHART, superintendent of motive power and machinery of the Union Pacific, at Omaha, Neb., has been appointed assistant general superintendent of motive power and machinery, with headquarters at Omaha. Mr. Neuhart entered railway service in June, 1918, as a coach cleaner in the employ of the U. P., later holding other minor positions until 1921 when he left the company. Two years later he returned as a machinist apprentice at Salt Lake City, Utah, subsequently holding positions at various points on the road including Pocatello, Idaho; Lima, Mont., Cheyenne, Wyo., and Kansas City, Mo. In February, 1937, Mr. Neuhart became superintendent of shops, with headquarters at Los Angeles, Calif.; in April, 1940, master mechanic at Kansas City, and in November, 1941, assistant to the vice-president in charge of research and mechanical standards, with headquarters at Omaha. For a short time he served as master mechanic at Los Angeles, and in August, 1942, was appointed superintendent of motive power and machinery, with headquarters at Omaha.

EDWIN GREY JONES, whose appointment as superintendent of motive power of the Charleston & Western Carolina at Augusta, Ga., was announced in the February issue, was born at Fayetteville, N. C., on March 31, 1902. He is a graduate of the George

(Continued on second left-hand page)



Let's get *down to earth*  
on train communication



**Dependable voice communication**

"Union" I.T.C. (Inductive Train Communication) system provides dependable, practicable two-way voice communication between vehicles of a train, between trains, and between trains and wayside points.

It is a train communication system designed exclusively for railroad use, by men who know railroad needs, and proved through years of regular railroad service.







As easy to use  
as the *telephone*  
... that's "Union" I.T.C.

Train communication systems are created by experts in that field but they are used by regular railroad personnel who have many diverse duties to perform.

That's why *simplicity and speed of operation* were included among the primary requisites governing the design of the "Union" Inductive Train Communication system.

Press a button on the handset to talk. Release it to listen. No special training is required.

Just one more reason why eight railroads have already discovered that, *in train communication, "Union" I.T.C. is the answer.*

Full information will be furnished without obligation by our nearest district office.

## UNION SWITCH & SIGNAL COMPANY

SWISSVALE

PENNSYLVANIA

NEW YORK

CHICAGO



ST. LOUIS

SAN FRANCISCO

School of Technology and the North Carolina State College of Agriculture and Engineering. He entered railroading in July, 1925, as a special apprentice in the Emerson shops of the Atlantic Coast Line and served subsequently at various points as air-brake machinist from June, 1927, to September, 1929, when he became plant engineer of the Tampa shops at Tampa, Fla. On November 1, 1933, he was appointed assistant mechanical instructor, with headquarters at Waycross, Ga., where he became gang foreman in September, 1938. One year later he returned to Tampa as assistant foreman in the locomotive department; in March, 1941, became erecting shop foreman and in July, 1942, general foreman of the Tampa shops.

EDWARD C. KAISER, general foreman of the Reading at Philadelphia, Pa., has been appointed superintendent of motive power of the Lehigh & New England, with headquarters at Pen Argyl, Pa.

R. R. SNEDDON, assistant to the superintendent of equipment of the Michigan Central at Detroit, Mich., has been appointed assistant superintendent of equipment, with headquarters at Detroit.

#### Master Mechanics and Road Foremen

H. F. DERRY has been appointed road foreman of engines, West End, Baltimore division, of the Baltimore & Ohio, with headquarters at Baltimore, Md.

K. A. LENTZ, master mechanic of the Southern at Somerset, Ky., has been transferred to Birmingham, Ala.

W. G. MCCONACHIE, master mechanic of the Canadian National at Edmonton, Alta., has retired.

JAMES E. GOGERTY, general locomotive foreman of the Union Pacific at Cheyenne, Wyo., has been appointed master mechanic, with headquarters at Denver, Col.

OSCAR J. ROBINSON, assistant master mechanic of the Union Pacific at Council Bluffs, Iowa, has been appointed master mechanic at that point.

E. N. STEWART, acting master mechanic of the Smithers division of the Canadian National at Prince George, B. C., has been appointed master mechanic, with headquarters at Prince George.

F. T. WALDEN, master mechanic of the Southern at Birmingham, Ala., has been granted a leave of absence because of illness.

H. E. NIKSCH, division master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, at LaCrosse, Wis., has been transferred to the position of division master mechanic at Chicago.

DAVID BEATH, acting master mechanic of the Canadian Pacific at Moose Jaw, Sask., has been appointed master mechanic of the Saskatchewan district, with headquarters at Moose Jaw.

S. H. DUBOSE, master mechanic of the Southern at Ludlow, Ky., has been transferred to the position of master mechanic at Somerset, Ky.

GEORGE C. SHUGARS, formerly an engine house foreman of the Reading, has been appointed master mechanic of the Reading division.

#### Obituary

A. T. PFEIFFER, road foreman of engines of the New York Central at Syracuse, N. Y., died on February 20. Mr. Pfeiffer was president of the Traveling Engineers' Association when that association amalgamated with the International Railway Fuel Association in 1936. At the time of his death he was a member of the Advisory Committee of the combined associations, the Railway Fuel and Traveling Engineers' Association.

#### Trade Publications

*Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.*

WELDING RODS.—Eutectic Welding Alloys Company, 40 Worth street, New York 13. Six-page folder on Eutectic low temperature rods which can be used with any oxyacetylene or electric-arc process for welding on cast iron, malleable iron, steel, copper alloys, nickel alloys, aluminum alloys, magnesium, tungsten carbides, etc.

BATTERIES FOR DIESEL LOCOMOTIVES.—Gould Storage Battery Corporation, Depew, N. Y. Catalog No. 700, "Gould Cathanode Glassklad Batteries for Diesel Locomotive Service." 20-page booklet gives pertinent facts on the application of storage batteries in Diesel locomotive service. Includes also a section on the basic principles of the lead acid battery and another on the care and maintenance.

HYDRAULIC CYLINDERS.—John S. Barnes Corporation, Rockford, Ill. Bulletin 401C describes Barnes line of hydraulic cylinders manufactured in conjunction with Barnes hydraulic pumps, valves, and self-contained hydraulic power units.

CLARK PRODUCTS.—Clark Equipment Company, Buchanan, Mich. Miniature 32-page booklet, in color, illustrates and briefly describes Clark Celfor drills and reamers, electric steel castings, metal spoke wheels, front and rear axles for trucks and buses, transmissions, gears and forgings, fork trucks and industrial tractors, railway car trucks, etc.

MASTS AND TOWERS.—The Harco Steel Construction Co., Elizabeth, N. J. Illustrated catalog describing masts and towers available for radio antennae, mounting of lights, etc. Units vary from 20 to 500 ft. in height and are characterized by being easy to erect. Types include guyed and self-supporting, square, triangular and tapered towers.

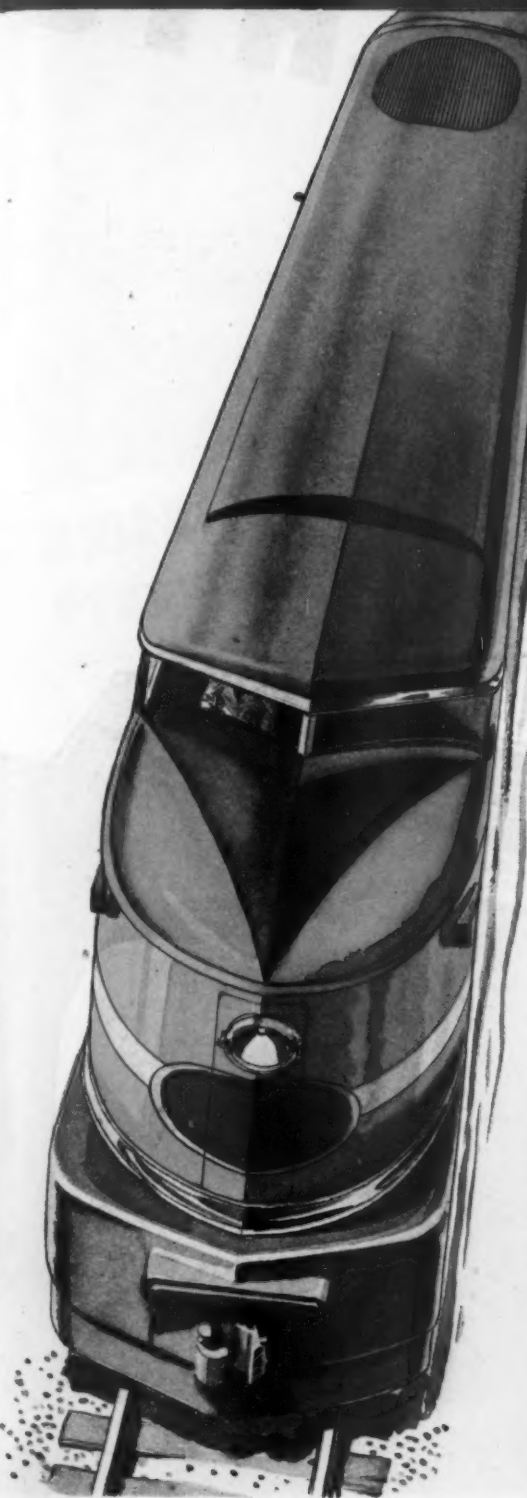
CORROSION.—The International Nickel Company, 67 Wall Street, New York 5. 54-page pamphlet—a comprehensive analysis of corrosion principles both for the practical man and the technician in the metal field. Explains how corrosion processes work and discusses known factors that influence their action. Analyzes applicability of Monel, nickel and Inconel in various corrosive media; lists typical corrosives in which these alloys have been successfully used, and reports the results of more than 120 specific tests under varied conditions in 44 common corrosive agents.

TURRET LATHE.—The Warner & Swasey Company, Cleveland 3, Ohio. Fourteen page illustrated pamphlet descriptive of the new No. 5 Universal turret lathe, twelve-speed all-gear head, with surface speed pre-selector.



The first New York Central 4-8-4 type locomotive for passenger and freight service was delivered by the American Locomotive Company on March 10—The locomotive, known as Class S-1, has a larger boiler than the Class L-4 4-8-2 freight and passenger type—It will be tested with both 75-in. and 79-in. driving wheels—The 25 additional locomotives on order will have 29-in. wheels.

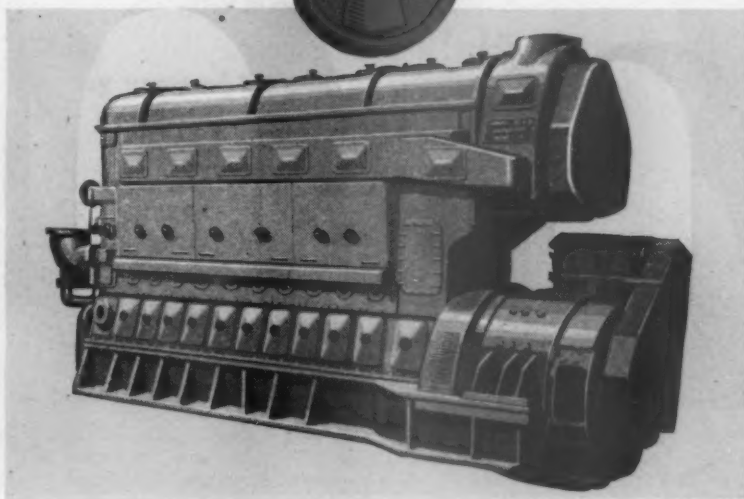
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POWER  
TODAY!**



It's the  
**Opposed-Piston  
Diesel Locomotive**  
by

**FAIRBANKS-MORSE**

*A name worth remembering*





# PREVENT SLID FLATS





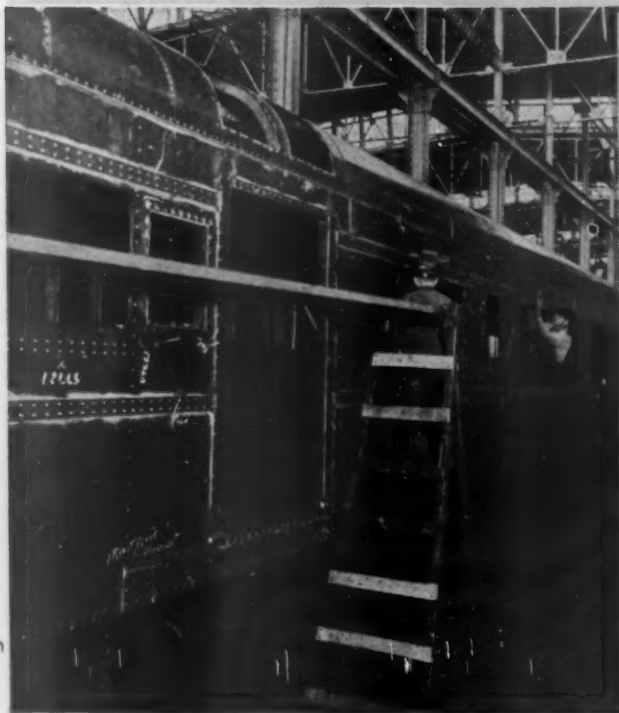
## **AMERICAN BRAKE SHOE CONTROLLER** **Prevents SLID FLATS During Braking**

- 1** Rugged and simple
- 2** Wheel slippage instantly detected and promptly corrected
- 3** Full brake restored as soon as slippage is eliminated
- 4** May be accurately tested when car is moving or standing
- 5** Proved by years of high speed passenger service

AMERICAN  
**Brake Shoe**  
COMPANY

BRAKE SHOE AND CASTINGS DIVISION  
230 Park Avenue, New York 17, N. Y.

# ***Our hand is skilled in***





# many metals

## OUR MIND IS OPEN TO ALL!

Builder of 2,000,000 freight and passenger cars in the present century alone . . . **A.C.F.** stepped not a bit out of character when called upon to construct 15,000 fighting tanks — and fast! True, the requirements were different — but so are one railroad's from another's for *normal* service.

*Starting from scratch, we developed our own formula — heat-treating 241,000 tons of homogeneous and case-hardened steel for tanks and armor plate for other manufacturers. Converted into railroad rolling stock, this tonnage would build 5,364 coaches or 6,886 tank cars; 15,093 box cars or 14,200 open type hopper cars — or 14,100 high side gondola cars.*

Today, we are again constructing passenger cars at our St. Charles plant. They are hospital cars of carbon steel — specially designed from the ground up to provide the utmost in comfort and care for the wounded of our Armed Forces. These cars are a marked advance over anything previously known for this type of service. And equally advanced . . . will be the **A.C.F.**-built coaches, club and dining cars of carbon steel . . . low alloy high-tensile steel . . . aluminum alloys . . . and stainless steel sheathing that will be needed by our railroads.

# A.C.F.

## AMERICAN CAR AND FOUNDRY COMPANY

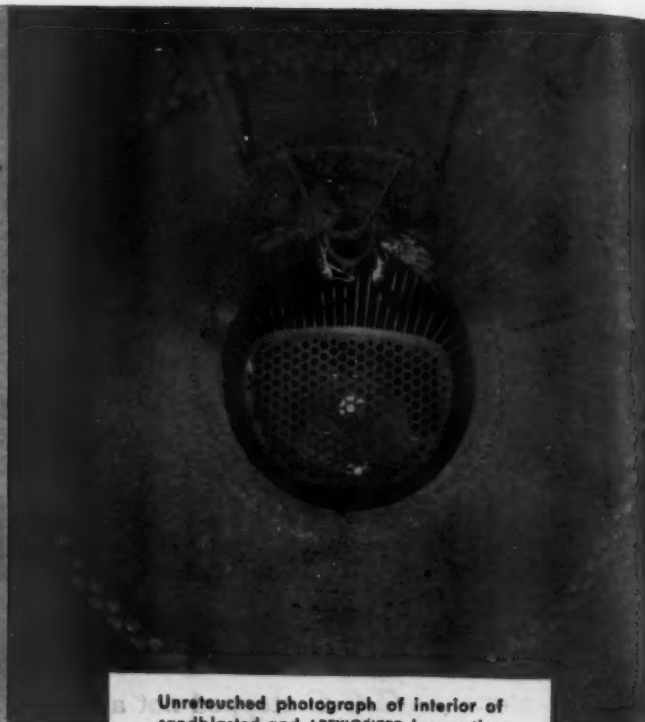
NEW YORK • CHICAGO • ST. LOUIS • CLEVELAND • WASHINGTON  
PHILADELPHIA • PITTSBURGH • ST. PAUL • SAN FRANCISCO

*Whatever A.C.F. Builds — it is Known to Build Well!*

# YOUR LOCOMOTIVE BOILER SHELLS CAN LOOK

*Like This*

## AFTER FLUE REMOVALS



Unretouched photograph of interior of sandblasted and APEXIORIZED locomotive boiler shell interior



**APEXIORIZED METAL  
SURFACES STAY  
CLEAN LONGER...  
WEAR LONGER...  
WASH MORE EASILY**

Now . . . there's no need for you to tie up locomotives and manpower for difficult cleaning of boiler shells, flues and firebox sheets. A protective surfacing of APEXIOR NUMBER 1 . . . only about .0025" thick . . . cuts down the clinging power of dirt and scale so that they accumulate more slowly and come off more easily.

Records of five years of service experience on steam locomotive boiler interiors show that brush-applied, corrosion-proof APEXIOR not only reduces cleaning time but also retards or checks corrosion and pitting of boiler surfaces. That's because it penetrates pores and joints to prevent water from touching the metal. Moreover, it doesn't affect heat transmission.

### APEXIOR SIMPLIFIES WORK OF WATER SERVICE DEPARTMENT

APEXIOR NUMBER 1 is not a substitute for

feed-water preparation or chemical treatment . . . but a supplement to the work of the chemist and water service engineer. By increasing the durability and raising the surface quality of boiler metal, it fortifies the metal in service under boiler water and steam temperatures and pressures.

APEXIOR surfacing also guards stay bolts and other water contact areas against the hazard of embrittlement or accelerated stress corrosion.

### APEXIOR NUMBER 3 FOR TENDER CISTERNS

APEXIOR NUMBER 3 protects the interior of locomotive tender cisterns. Brush-applied cold, it dries to a smooth, shiny jet-black. It resists all boiler-water-treating chemicals and corrosion-proofs surfaces in contact with potable water.

### APEXIOR ALWAYS AVAILABLE

Both APEXIOR surfacing materials are being shipped every day to industrial power plants, utilities, marine users and railroads throughout the country.

Write today for bulletin describing how APEXIOR saves metal, time and money.

*Keeps new metal new*



*Gives old metal new life*

## THE DAMPNEY COMPANY OF AMERICA

HYDE PARK 36, BOSTON  
MASSACHUSETTS

ATLANTA

CHICAGO

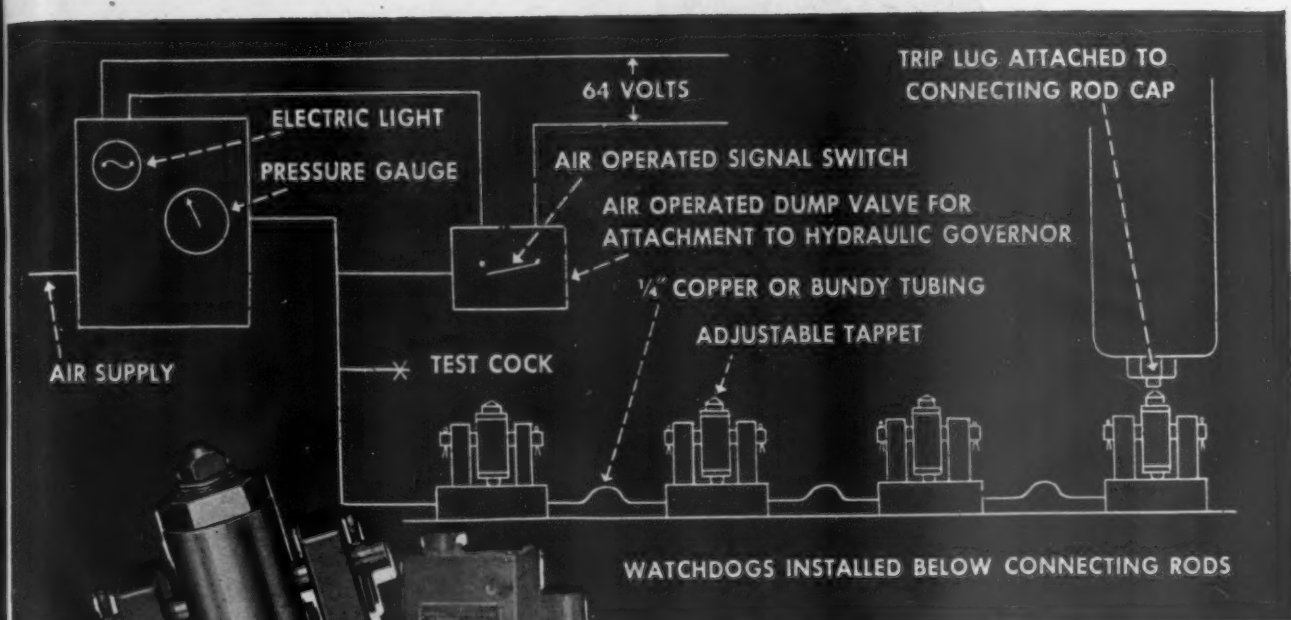
NEW YORK

DETROIT

PHILADELPHIA

# CUT <sup>DIESEL</sup> Maintenance COSTS!

with the BEARING WATCHDOG... *Crankshaft Protector*



- PROTECTS THE CRANKSHAFT
- PERMITS MAXIMUM BEARING WEAR
- FREQUENT BEARING INSPECTION UNNECESSARY
- LOCATES FAULTY BEARING INSTANTLY
- SIMPLE... POSITIVE... LOW MAINTENANCE
- PNEUMATICALLY OPERATED
- PROTECTS THE ENGINE

By installing the Bearing Watchdog System, wear beyond predetermined standards, or shell-out of connecting-rod and main bearings on your Diesels can be detected in plenty of time to prevent damage to the crankshaft. Any bearing failure, broken connecting-rod bearing cap, cap bolt, or connecting-rod, will actuate the trip-lever resulting in engine shut-down within a few seconds.

The Bearing Watchdog System operates by compressed air from the main reservoir, through the Serv-O-Motor of any standard hydraulic governor. No electrical circuits or fluids enter the crankcase. The Bearing Watchdog System will save your company thousands of dollars and the loss of many hours operating time for your Diesel equipment.

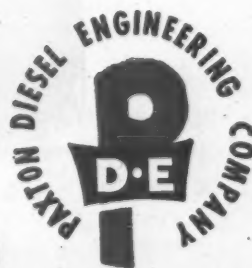
This system has been thoroughly tested and proved on leading railroads and offers inexpensive insurance against expensive crankshaft repairs and replacements. Write today for detailed information.

**paxton**  
**DIESEL ENGINEERING COMPANY**

2614 Martha Street  
Omaha 5, Nebraska

DIESEL SPECIALTIES ★ PARTS ★ REPAIR SERVICE

A Subsidiary of PAXTON-MITCHELL COMPANY  
Manufacturers of P-M Metallic Rod Packing



*Install the*

**BEARING  
WATCHDOG  
SYSTEM**

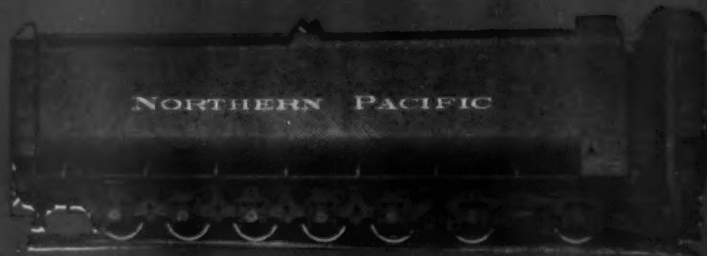
... IN YOUR DIESELS

We invite inquiries from Diesel Manufacturers  
and Diesel Designing Engineers





# Check the Proven

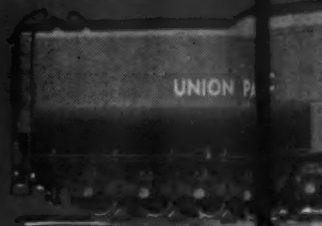


25,000 Gallons Water—27 Tons Fuel



UNION PACIFIC

23,500 Gallons Water  
—25 Tons Fuel



UNION PACIFIC

23,000



NEW YORK CENTRAL

17,500 Gallons Water  
—43 Tons Fuel



23,000



25,000 Gallons Water  
—6530 Gallons Fuel



231

H. M. S.

25,000



Rio Grande



10

25,000 Gallons Water—28 Tons Fuel

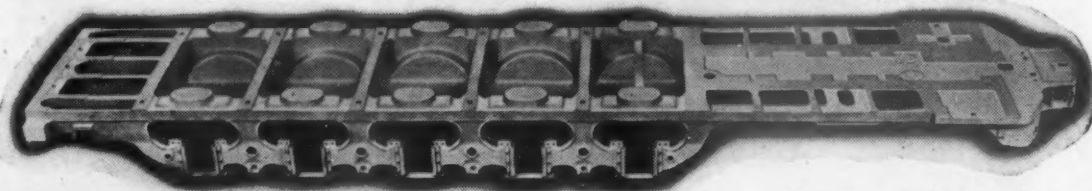
# GENERAL STEEL

# Advantages of Building Your Tenders with COMMONWEALTH TENDER BEDS

**T**o meet the needs of today and the competition of tomorrow, modern, large-capacity tenders reduce the number of stops and delays for water and fuel. The outstanding advantages of tenders built with TENDER BEDS are:

- ✓ A reduction in tender weight per gallon capacity
- ✓ Lighter loads per wheel with a more uniform distribution of weight at rail
- ✓ Greater water and fuel capacity without exceeding present limits of height, width, and length of tender
- ✓ Lower center of gravity, allowing use of larger diameter wheels
- ✓ Less maintenance, due to the simplicity of the design

Proof of the wide acceptance of this improved tender design is found in the fact that from 1939-1945, eight railroads equipped 260 locomotives with tenders having COMMONWEALTH TENDER BEDS.



Commonwealth Tender Bed

23,000 Gallons Water—21 Tons Fuel

## CASTINGS

EDDYSTONE, PA.  
GRANITE CITY, ILL.



HERE IS THE  
HEATING PLANT

HERE IS THE  
INSULATION

HERE IS THE  
PASSENGER

## THE INSULATION IS WOVENSTONE

THE PASSENGER  
IS COMFORTABLE



Wovenstone provides permanent protection for steam lines from the ravages of weather—maintains highest possible temperatures from the locomotive back to the last car of the longest trains. Wovenstone will not loosen, sag or shake down—remains firm and snug against the pipe at all times. Can be removed and reapplied without loss of original efficiency.

**UNION ASBESTOS**  
**MEANS PROGRESS IN INSULATION**  
**AND RUBBER CO.**

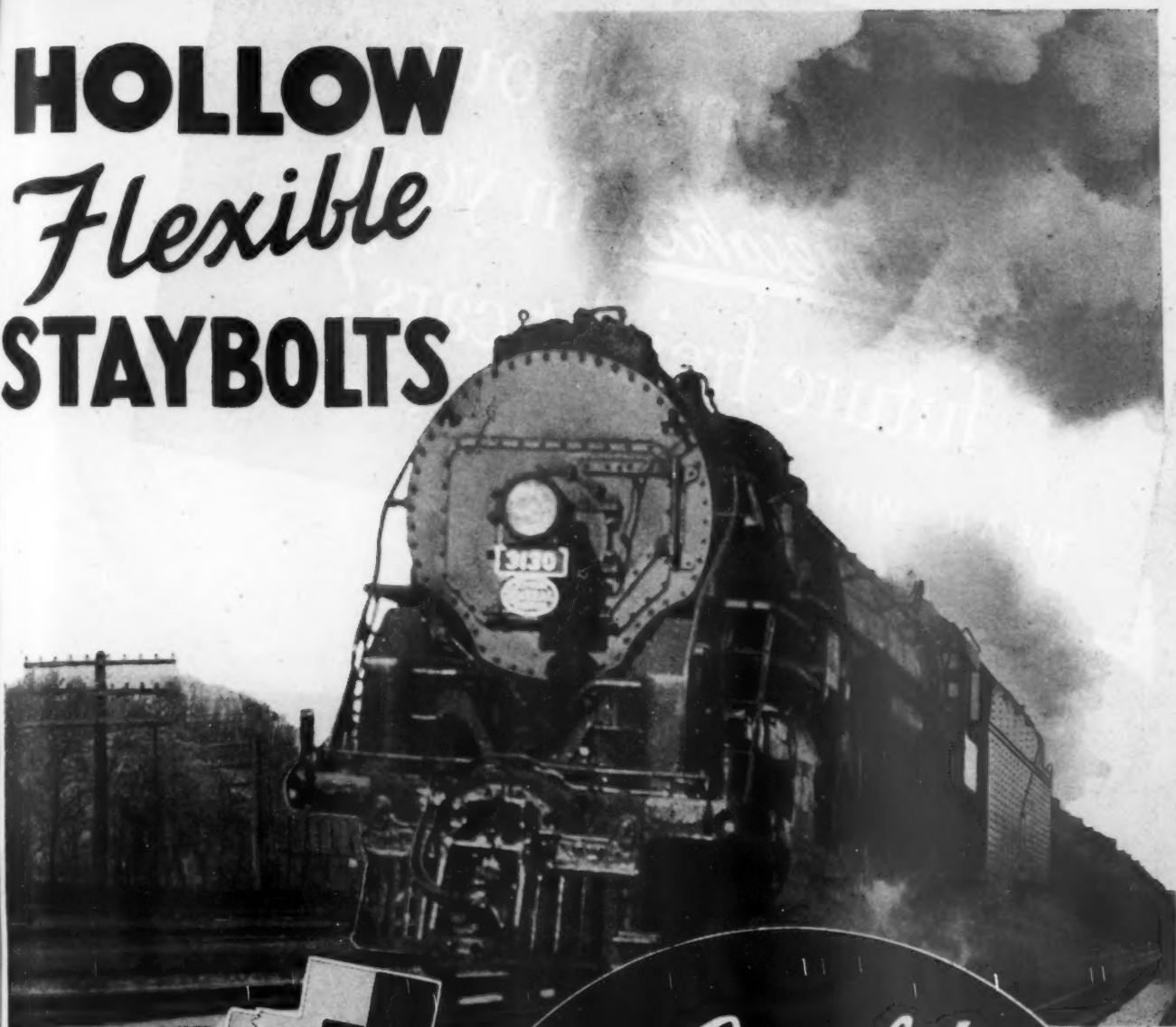
310 S. MICHIGAN AVE., CHICAGO 4  
NEW YORK      SAN FRANCISCO

KEEP ON BUYING  
WAR BONDS!

RAILWAY MECHANICAL ENGINEER



# **HOLLOW** *Flexible* **STAYBOLTS**



*Complete  
Installations*

INSURE MAXIMUM  
GROSS TON-MILES

**FLANNERY BOLT CO.**  
BRIDGEVILLE PENNA.

Thinking about  
*lightweight* in your  
future freight cars?

HEAR WHAT AUTHORITIES SAY...

**U.S.S. COR-TEN  
IS AGAIN READY TO SERVE YOU**

Now that COR-TEN—the pioneer low-alloy, high-strength steel—is again available for freight car construction, your new equipment can be built lighter, stronger, longer-lasting and more efficient than ever before. Our engineers will gladly show you how lightweight construction with COR-TEN can be applied to your designs, what it will cost, and the sound economic reasons that justify its use.

AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago, New York  
CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago  
COLUMBIA STEEL COMPANY, San Francisco  
NATIONAL TUBE COMPANY, Pittsburgh  
TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham  
United States Steel Supply Company, Chicago, Warehouse Distributors  
United States Steel Export Company, New York

## GETTING RID OF DEAD WEIGHT ... A FUTURE "MUST"

"The relationship of dead weight to pay load has been indicated specifically as requiring attention.—Improvement in the efficiency of the power unit has been vitiated through expenditure of the increased weight of the vehicle of transport because of the freight car.—Locomotives are doing more work today than twenty years ago, but a greater proportion of their total tractive force is consumed in moving weight, which adds nothing to the return.—In view of the prospective intense competition after the war, ... any measure that will reduce the present proportion of energy expended in hauling dead weight over the road will ... improve the railroads' chances in the coming struggle."

*Excerpts from article by Herbert Ashton,  
Asst. to Director, Division of Railway  
Transport, O.D.T.; in Railway Age,  
Sept. 23, 1944.*

## SAVING WEIGHT MEANS SAVING MONEY

"It is a much discussed question as to the amount of money saved by reducing weight of freight cars. Probably an average figure, and it can only be an estimated average, inasmuch as the cost of hauling cars must be based on conditions prevailing on the individual road being considered, a saving of one mill per ton-mile will do for the purpose of illustrating the economics involved in weight reduction. If we accept 15,000 miles as a yearly average mileage on a road, then every ton reduction in weight amounts to \$15.00 saving per year."

*From address by E. D. Campbell, Vice  
President i/c Engineering, A.C.F. Co.;  
delivered before Southern and Southwest-  
ern Railroad Club, Sept. 21, 1944.*

## LIGHTWEIGHT EQUIPMENT HAS PROVED ITSELF

"From 1935 to 1939 inclusive, 35,027 cars out of a total of 152,108 new freight cars installed by Class I railroads in the U.S.A. were built wholly, or in part, of one of the leading high-strength, low-alloy steels\*. This represents 23% of the equipment installed. These cars—plus 7,117 new lightweight freight cars\* installed on Class II and Class III railroads and exported to foreign lines—are still in service, have carried the heaviest loads on record without failure."

*From article by Fred D. Foote, President,  
Alloys Development Corporation; Rail-  
way Purchases and Stores, Jan. 1945.*

\*U-S-S CON-TEN.

## ONE MATERIAL IDEAL FOR WEIGHT REDUCTION

"Unless new materials as yet unrevealed emerge from war production laboratories, it seems likely that high-tensile, low-alloy steel will continue to be the most extensively used structural metal, because for car-building purposes it represents an ideal balance between lightweight and low cost."

*From article by Ellis W. Test, Asst. to  
President in charge of engineering and  
research, Pullman-Standard; Railway Pur-  
chases and Stores, Jan. 1945.*



# UNITED STATES STEEL





# SUPERIOR

## 3-WAY FLUE ROLLER

This little tool does a complete job, a quick job, a thorough job. It is called the 3-Way Flue Roller because it Expands, Prossers and Flares, in one operation.

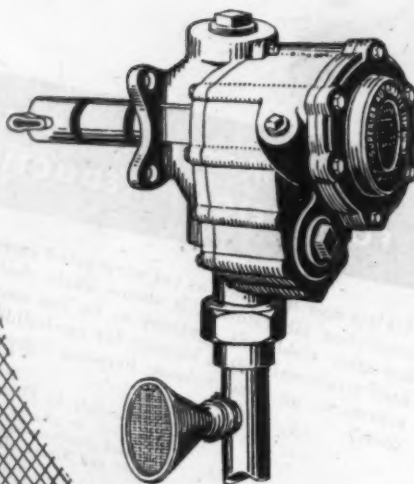
Saves fully 80% in time and labor and affords a high degree of safety. These are not just hopeful claims, they are proven facts easily verified and they mean important economy at this time.

Write for more information

**SUPERIOR RAILWAY PRODUCTS CORP.**  
7501 Thomas Boulevard, Pittsburgh, Penna.

Many case histories are available to show the practicability of the Superior Automatic Flue Blower and its efficiency in stepping up and maintaining motive power. Its use assures longer hauls and heavier loads, less fuel consumption, and reduces "down-time" to routine inspections.

Full information upon request



# SUPERIOR

*Automatic*

## FLUE BLOWER



## *The Engineer Says* **"WHAT A RELIEF!"**

Many a locomotive engineer has made this remark after his engine has been packed with GARLOCK Packing. No more steam leaks — and everybody's happy!

GARLOCK Packings give long, dependable service because they are manufactured in our own plant and are quality-controlled from raw material to finished product.

**THE GARLOCK PACKING COMPANY  
PALMYRA, NEW YORK**

*Manufacturers of GARLOCK Packings, Gaskets and KLOZURE Oil Seals*  
In Canada: The Garlock Packing Company of Canada, Ltd., Montreal, Que.



Garlock Chevron automatic action packing has proved itself on thousands of locomotive throttles and other locomotive applications. The unique hinge-like, cross-sectional design allows the packing to expand and contract—the greater the pressure, the tighter it packs.



# Garlock

*Soften up* THE SHOCK!



Style A-6-A Holland *Volute* Snubber Springs

Spring Groups, too, suffer from "shock"—the constantly hammering blows of war-time loads and speeds. Easing these shocks on many a car today are Holland Volute Snubber Springs.

*Uncle Sam Uses Volute Springs on Many Tanks*



Signal Corps  
Photo

762

**HOLLAND**  
COMPANY

332 SOUTH MICHIGAN AVENUE, CHICAGO, ILLINOIS



# FOR RESISTANCE TO FATIGUE

—no other material can equal **ALLOY STEELS**



Fatigue failure—insidious enemy of working parts, especially those subject to sudden reversal of stresses or those which must resist varying concentrations of stress such as the locomotive parts shown above—can best be avoided by the use of alloy steels.

For alloy steels surpass all other materials in strength—and in the ability to maintain it under the most severe conditions.

And that is only one reason for your use of alloy steels. Others include a uniform, predetermined response to hardening—resulting in high resistance to wear. High strength-to-weight ratios which permit reduction of sections and weight

with safety. And resistance to severe strains, shock, high temperatures, sub-zero cold and corrosion which mean safety, long service life and low maintenance and replacement costs.

Republic—world's leading producer of alloy steels—offers you the benefit of its unequalled experience in the selection and fabrication of the most efficient and most economical alloy steel for each use. A Republic metallurgical engineer is ready to visit you at your convenience. Just write to—

## REPUBLIC STEEL CORPORATION

*Alloy Steel Division • Massillon, Ohio*

GENERAL OFFICES • CLEVELAND 1, OHIO  
Export Department: Chrysler Building, New York 17, N.Y.



*Republic*

**ALLOY STEELS**

Also Carbon and Stainless Steels—Sheets—Plates—Pipe—Open Rails, Bars and Rivets—Electricity Solder Tubes

# POWER...

without traction is wasted



INSURE  
**FULL POWER at the rail**  
 with  
**Graham-White  
 Sanders**

The right amount of sand at the rail when you want it... that's your assurance of traction—full power to start or stop always. Graham-White Sanders insure locomotive traction under all rail and weather conditions. Be sure and safe... protect your locomotive investment with Graham-White Sanders . . . backed by over twenty-eight years of engineering "know-how."

Write today for detailed information



## PRIME

essential equipment for steam,  
 diesel and electric locomotives  
**MILWAUKEE 4, WIS.**

# Power to go...



# there and back...



# time after time



How this inherent advantage of  
railroad Diesels is further assured  
with Nonpareil HD Diesel Oil

REMARKABLE records have been made by railroad Diesels in long hauls or in extended periods of operation with the minimum of maintenance and servicing. An important factor in this record-making service is clean engine operation—a factor that is vitally affected by the lubricating oil used.

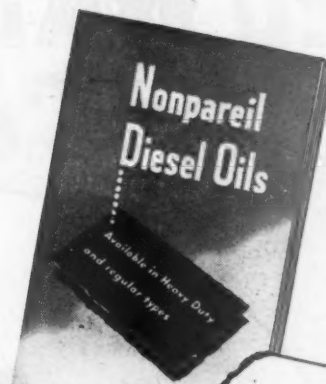
The booklet pictured at the right fully describes why a truly HD (heavy-duty) oil such as Nonpareil HD—containing a new, remarkable oxidation inhibitor and detergent additive—reduces all types of troublesome engine deposits.

Cleaner operation—freedom from varnish, ring stick-

ing, crank case and other oil deposits—means that your Diesels will give maximum power longer, wear less, and require less time and labor for servicing between runs.

Send for this booklet, or better still, arrange for a test of Nonpareil HD Diesel Oil on one of your runs. Find out on your own equipment how Nonpareil HD Diesel Oil will reduce Diesel engine maintenance. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Buy more War Bonds



SEND FOR  
THIS BOOKLET

It tells why heavy  
duty oils reduce  
Railroad Diesel  
maintenance.



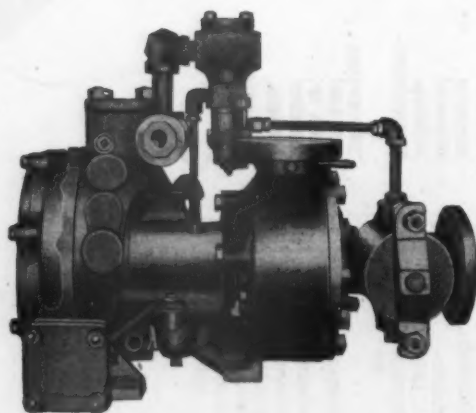
## STANDARD OIL COMPANY (INDIANA)

STANDARD  
SERVICE

★ LUBRICATION ENGINEERING



# FEED WATER HEATING *By Coffin*



THE BOILER FEED  
PUMP

The Coffin Centrifugal Pump with integral piped control valve, assures semi-automatic operation of the entire Feed Water Heater System at low cost in live steam consumed.

THE J. S. COFFIN, JR., COMPANY  
Englewood, New Jersey



**PLEASE SEND FEED WATER HEATER BULLETIN**

**NAME** \_\_\_\_\_

**COMPANY** \_\_\_\_\_

**ADDRESS** \_\_\_\_\_

*New type*  
**steam-turbine locomotive**  
 introduced by  
**Pennsylvania**

**MORE POWER** from a locomotive of given dimensions, smoother operation, higher efficiency, greater availability are a few of the advantages expected from this turbine-driven locomotive equipped with NATIONAL Seamless Boiler Tubes.



**R**AILROAD men all over the country are showing great interest in the Pennsylvania's new steam-turbine locomotive, the S-2. It represents the most radical change of design in steam locomotives in decades.

For the first time in this country, the high efficiency of the direct-connected steam turbine has been applied to locomotives. The turbine develops 6900 hp. which is transmitted to the driving wheels through double reduction gears. For reversing, a separate turbine is connected to the head pinion through a clutch. Extensive main-line tests are expected to show an improvement in efficiency over reciprocating-engine performance of about 20% more power for the same steam.

The boiler operates at 310 psi. and 750 F. which

is not high for modern locomotives. And because one of the design objectives was *maximum* availability, Seamless Boiler Tubes were chosen. Year-in and year-out service in other locomotives has proved the extra long life and dependability of these tubes.

Records show that modern steam locomotives with NATIONAL Seamless Boiler Tubes are capable of operating twice the number of miles per month as steam locomotives built 20 years ago. A steam locomotive operating on a western road made 10 complete round trips in 30 days of 1839 miles each or 18,390 miles—613 miles per day.

For this kind of service, NATIONAL Seamless Boiler Tubes pay out in more time on the rails—less time in repair shop.



**NATIONAL TUBE COMPANY**  
*Pittsburgh, Pa.*

Columbia Steel Company, San Francisco, Pacific Coast Distributors  
 United States Steel Export Company, New York



**UNITED STATES STEEL**



# GOOD MAINTENANCE EQUIPMENT DESERVES GOOD MAINTENANCE MATERIALS

• With manpower scarce . . . and traffic heavy . . . it's more important than ever to keep work equipment in A-1 condition.

When maintenance on this equipment becomes necessary, use Johns-Manville specialized packings and friction materials. It is one of the best forms of "trouble-free insurance."

**J-M Packings** are made in specialized forms for all types of service equipment . . . from creosoting tanks to water-treating stations and air compressors.

**J-M Friction Materials** are available in special sizes and types for cranes, draglines, tractors and other roadway equipment.

For full information about these Johns-Manville Materials for railroad uses, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.



## Johns-Manville

87 YEARS OF SERVICE TO TRANSPORTATION

Insulations

• Packings

• Friction Materials

• Refractory Cements

• Building Materials



# TEST SHOWS SAVING of \$262.60 in 157,076 mile run!



## RPM DELO lubricates Rock Island "Rocket" Diesel engine better — at reduced cost

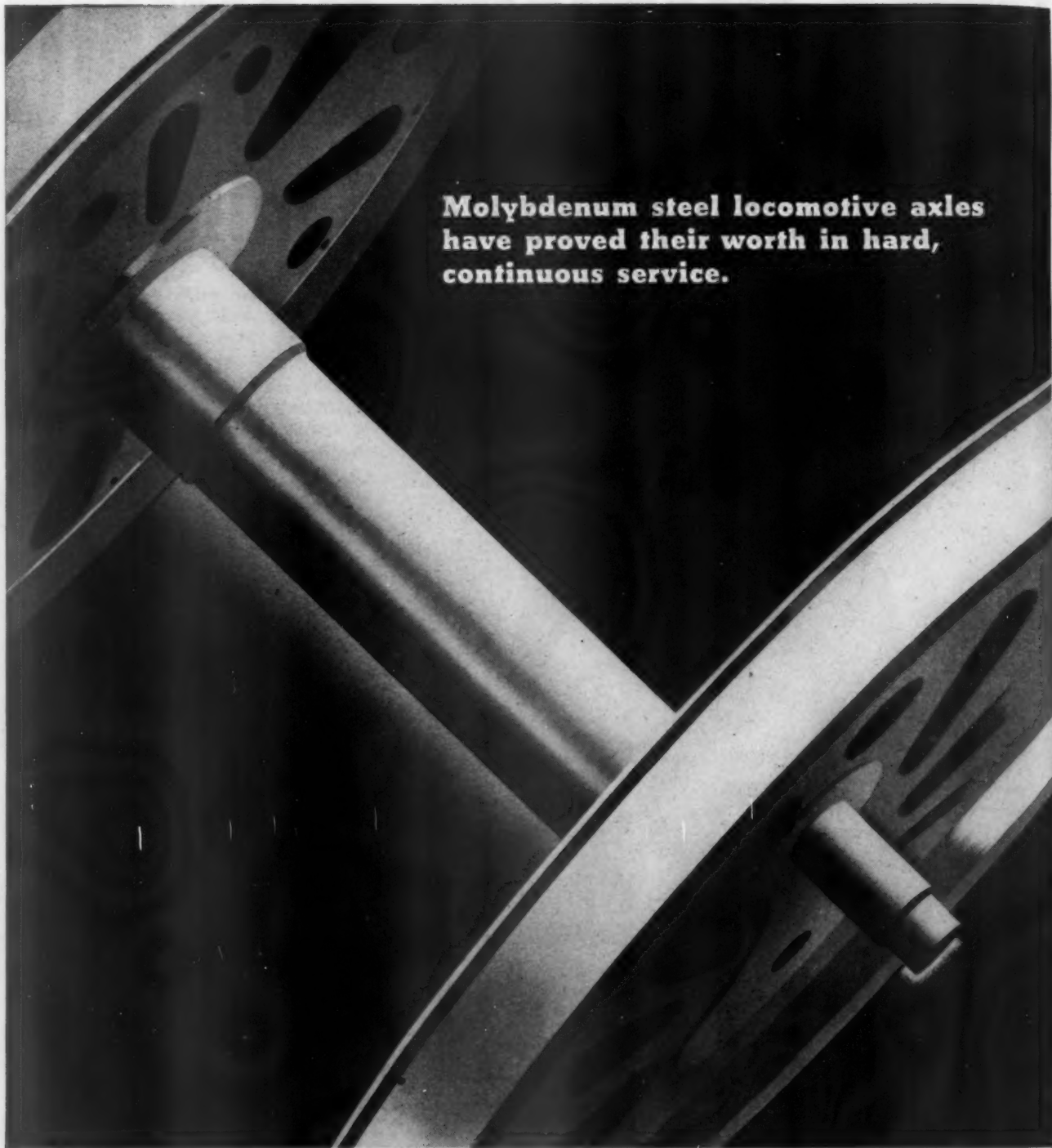
A Rock Island "Rocket" ran 157,076 miles on RPM DELO Diesel Engine Lubricating Oil without an oil change, adding make-up oil only as required. The test proved that the inhibiting, detergent and peptizing properties of RPM DELO cut down piston and liner wear, kept rings free and ports unclogged, maintained better cleanliness of entire engine assembly, chalked up a savings of \$262.60 in oil cost.

RPM DELO will give you greater engine availability, too. Get full information from your RPM DELO Distributor, or write for details.



Write on your letterhead for free booklet on RPM DELO to Standard of California, Dept. R-1, 225 Bush St., San Francisco 20, Calif., or California Commercial Co., 30 Rockefeller Plaza, New York 20, N. Y.

## STANDARD OF CALIFORNIA



**Molybdenum steel locomotive axles  
have proved their worth in hard,  
continuous service.**

**CLIMAX FURNISHES AUTHORITATIVE ENGINEERING  
DATA ON MOLYBDENUM APPLICATIONS.**



**MOLYBDIC OXIDE, BRIQUETTED OR CANNED •  
FERROMOLYBDENUM • "CALCIUM MOLYBDATE"**

**Climax Molybdenum Company**  
**500 Fifth Avenue • New York City**

# SAFETY & COMFORT



## A.A.R. TIGHTLOCK COUPLERS

Eliminate slack in coupler contour.

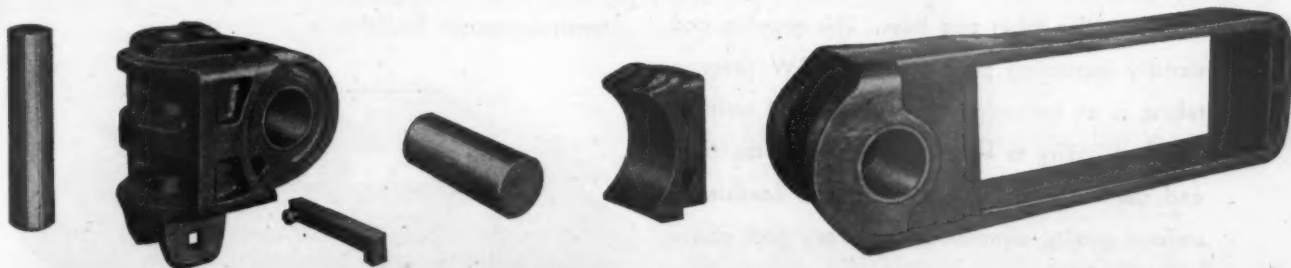
Eliminate noise caused by coupler slack.

Interlocking feature prevents telescoping and turning over of cars.

Improved anti-creep arrangement, and A. A. R. No. 6 operating mechanism prevents train separation.

Will couple with present standard and M. C. B. type couplers, and when so coupled provides substantial reduction in contour slack.

Wear of coupler head and parts is materially reduced, thus increasing the service life.



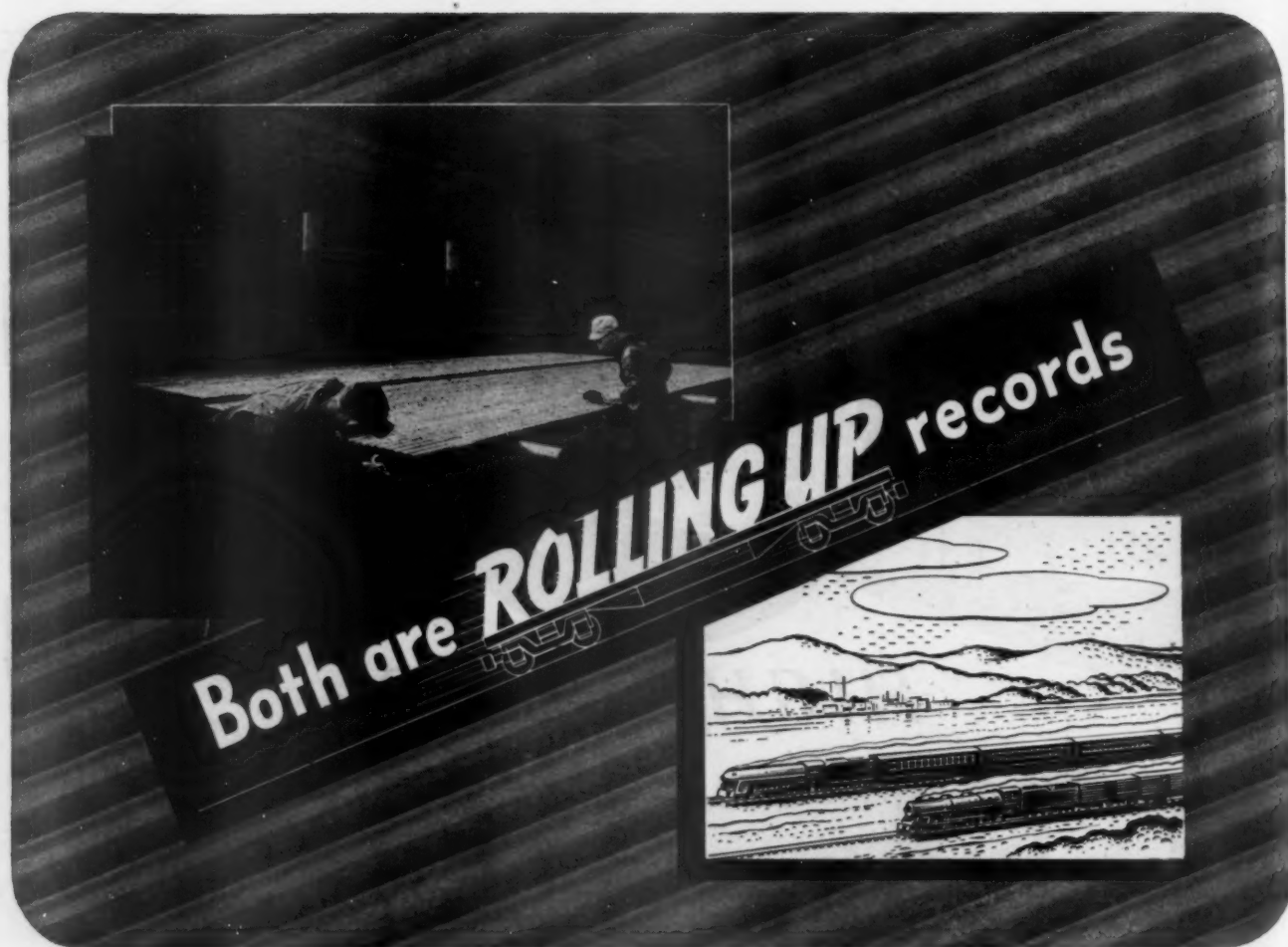
**NATIONAL MALLEABLE AND STEEL CASTINGS CO.**

*General Offices:* CLEVELAND, OHIO

*Sales Offices:* New York, Philadelphia, Chicago, St. Louis, San Francisco.

*Works:* Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.





While America's railroads were rolling along to new records . . . in mileage, tonnage, military and civilian traffic . . . demands for B&W pressure tubing—both seamless and welded—also set new records in 1944. For example, shipments of welded pressure tubes alone were over 100 percent higher than in 1943. Altogether B&W has produced over 700,000,000 lineal feet of both kinds—much of it for locomotive tubes and flues. This growing and steadily increasing preference for B&W pressure tubing is an indication of their all-round satisfaction and ability to keep locomotives on the road and out of the shop. It reflects their consistently uniform quality, dimensional accuracy and, above all, the enviable record of safety and service they

are giving under traffic conditions that today put a premium on availability of motive power.

Because B&W makes BOTH Seamless and Welded Tubes, you can depend on unbiased recommendations . . . tubes and flues matched to jobs without prejudice toward any type or material . . . when you call on B&W's wealth of tubing experience, modern specialty tube mills and extensive research facilities.



## B&W TUBES

SEAMLESS. Complete range of carbon alloys and stainless steels

Sizes: 1/2 in. to 8 3/4 in. O.D.

ELECTRIC-Resistance Welded Carbon grades.

Sizes: 3/4 in. to 4 in. O.D.

THE BABCOCK & WILCOX TUBE COMPANY

Seamless Tube Division  
Beaver Falls, Pa.

Welded Tube Division  
Alliance, Ohio

TA 1323

14 years  
of service from

dictated the  
"specs" for this  
replacement

When this car—built in 1930—rolled in for its *first deck repairs* last year, there wasn't any debate or discussion as to what material would be used for replacement. The original pressure-creosoted decking has lasted almost three times as long as the average service from untreated decking, so naturally pressure-treated wood was installed.

This service isn't unusual by any means, but right in line with other reported experience. One western road decked 287 flats with pres-

sure-creosoted decking back in 1928. The average life computed from replacements was 12.41 years, as compared to a conservative estimate of the life of untreated decking of 4 years—again an approximate 3-to-1 ratio.

Generally the extra cost of pressure-treating decking is made up

in the first 18 to 22 months of added life, and each additional year of service is "velvet." And remember—outside of the savings feature, the use of pressure-creosoted decking is one of the best ways of keeping badly needed cars out of over-worked shops and on the rails. May we serve you?



**KOPPERS COMPANY, INC.—WOOD PRESERVING DIVISION**  
PITTSBURGH 19, PA.

**KOPPERS**

**Buy War Bonds—  
and Keep Them!**

THE INDUSTRY THAT SERVES ALL INDUSTRY



# 200,000 MILE

cylinder packing isn't just coming

# IT'S HERE!

Making cylinder packing replacements only at Class 3 Repair periods may sound like a dream . . . but it isn't.

American Hammered Bronze-Iron Cylinder Packing—(developed by our engineers)—is giving service up to 200,000 miles.

One large railroad reported that without the greater locomotive availability made possible by the long life of this packing, they could not have handled present volume of traffic.

This is just another example of how American Hammered research is solving ring problems.

**KOPPERS COMPANY, INC.**  
American Hammered Piston Ring Division  
Baltimore 3, Maryland



Buy More War Bonds—  
and Keep Them!

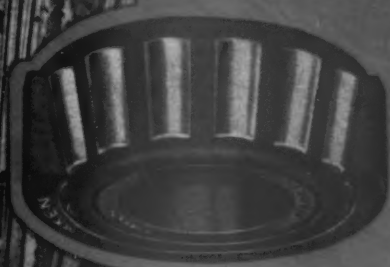
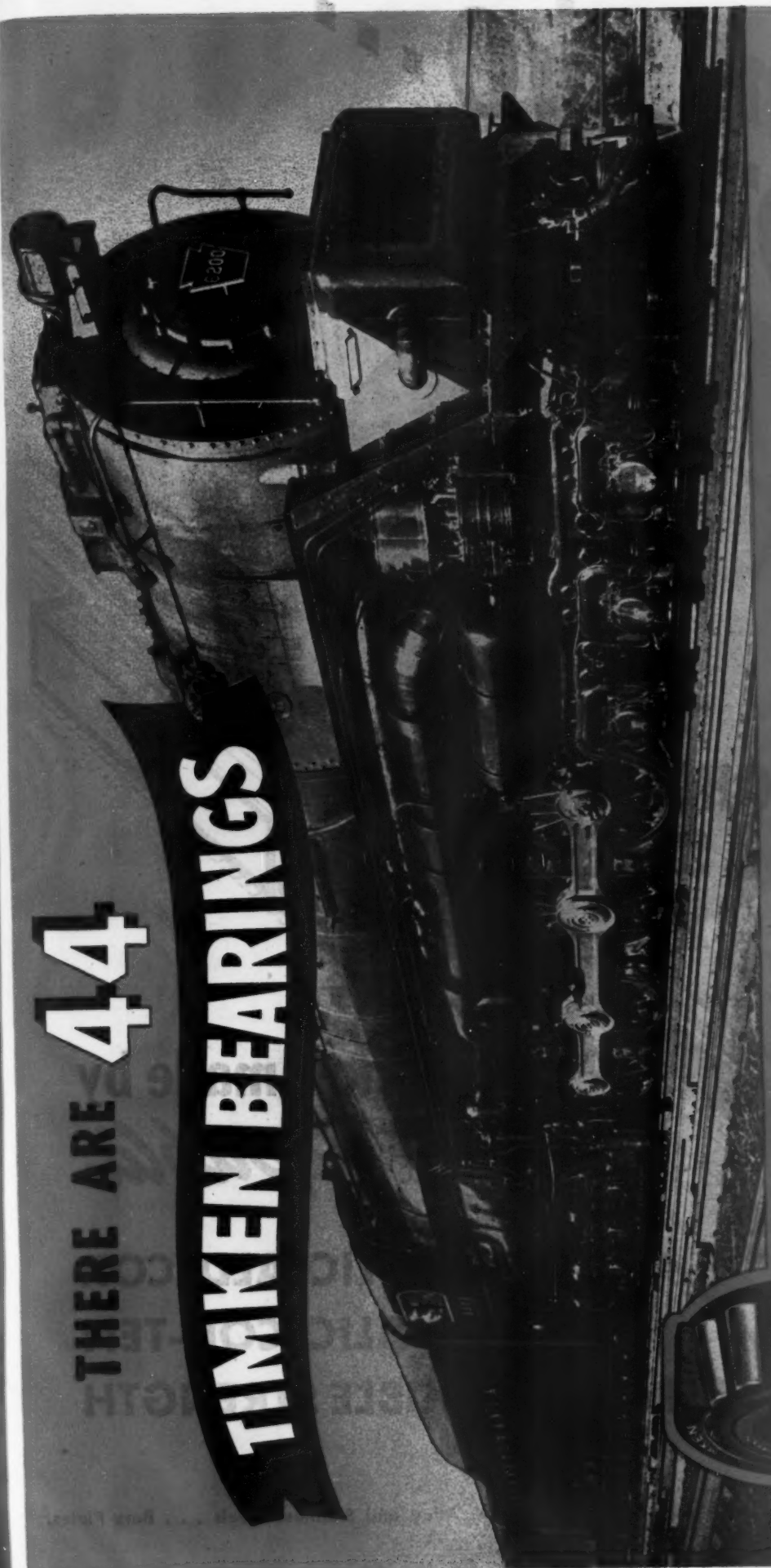


Four stars awarded  
for excellence  
in war production.



THERE ARE **44**

**TIMKEN BEARINGS**



USED ON ALL AXLES AND SIDE ROD CRANK PINS ON THIS  
PENNSYLVANIA DIRECT DRIVE STEAM TURBINE LOCOMOTIVE

*First of its kind ever built in the United States*

**THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO**

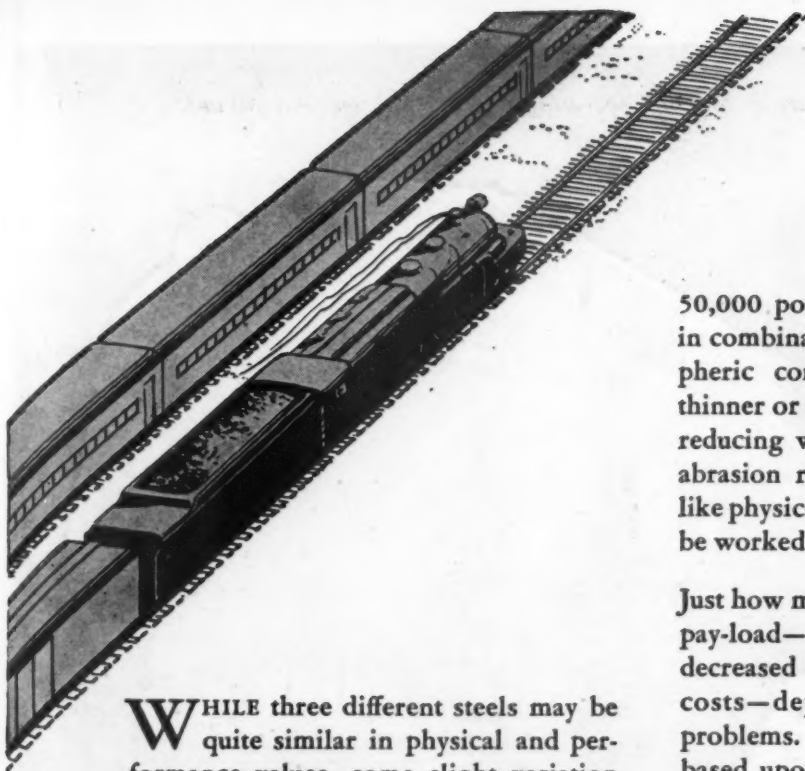
Not One...  
**NOT TWO...**



now made by  
*Republic*

**REPUBLIC ALDECOR  
REPUBLIC COR-TEN  
REPUBLIC DOUBLE STRENGTH**

Other Republic Products include Carbon, Alloy and Stainless Steels . . . Bars Plates;



**W**HILE three different steels may be quite similar in physical and performance values, some slight variation may fit one of them to do a specific job more efficiently and more economically than either of the other two.

That is why Republic, consistent with its policy of providing industry with a complete range of steels to cover *all* individual requirements, now offers the railroad industry **THREE** different High Strength Steels—ALDECOR, COR-TEN and REPUBLIC DOUBLE STRENGTH.

The primary purpose for which these steels are produced in bars, plates, sheets and strip is that of building weight-saving transportation equipment—equipment in which dead-weight is held to the lowest possible point commensurate with safety and cost.

From a physical standpoint, all three provide a minimum yield strength of

50,000 pounds per square inch, which, in combination with resistance to atmospheric corrosion, permits the use of thinner or smaller sections as a means of reducing weight. All three are equal in abrasion resistance to carbon steels of like physical properties. And all three may be worked and welded without difficulty.

Just how much you can gain in increased pay-load—or how much you can save in decreased operating and maintenance costs—depends upon your particular problems. Estimates can now be made based upon the performance and experience obtained from COR-TEN and DOUBLE STRENGTH during more than a decade of use in railroad equipment. And while ALDECOR, *the newest development in high strength steels*, does not have this background of use, its qualities indicate that it may be preferred for certain applications as it becomes better known.

To help you use these steels to best advantage, Republic offers you the experience of its metallurgical staff. These men are ready to cooperate with your staff in studying your requirements and in determining which high strength steel to use. Please let us know as far in advance as possible the date on which you would like a Republic representative to call.

#### REPUBLIC STEEL CORPORATION

GENERAL OFFICES • CLEVELAND 1, OHIO  
Export Department: Chrysler Bldg., New York 17, N. Y.



*Republic*

## HIGH STRENGTH STEELS

ALDECOR • COR-TEN • DOUBLE STRENGTH

Sheets, Strip, Bolts and Nuts, Rivets, Pipes, Boiler Tubes, Mechanical Tubing, Fabricated Steel Products.



The Illinois Central's fast "City of Miami," operating between Chicago and Miami.



*"City of Miami"*  
RUNS  
230,000 MILES

*With*

## MH NO MAINTAINANCE COST ON SHUTTER CONTROL SYSTEM!

SINCE the Minneapolis-Honeywell Diesel Engine Shutter Control System was installed on the "City of Miami" a year ago, the train has run 230,000 miles with no maintenance cost and no service adjustments on the Control System.

This crack flyer operates between Chicago and Miami, Florida — a distance of 1,500 miles — leaving every third day. What makes this record truly impressive is the extreme contrast in weather conditions between each end of the run.

Conclusive tests under road conditions have also proved that general maintenance costs are lower, due to the constant engine temperature

provided by the system. This is accomplished by means of an air operated thermostat located in the cooling water system, which regulates the shutter governing the flow of air through the engine radiators . . . The M-H Shutter Control System is easily installed on any diesel locomotive and the savings in operating and maintenance will liquidate the cost of the installation in a very short time. If you have not investigated the advantages of M-H Diesel Engine Shutter Control Systems, do so at once. Write or phone: Minneapolis-Honeywell Regulator Co., Railway Controls Div., 433 East Erie St., Chicago 11, Ill.

MINNEAPOLIS  
**Honeywell**  
CONTROL SYSTEMS



NORFOLK AND WESTERN RAILWAY

uses the SPICER  
*Positive*  
Generator Drive



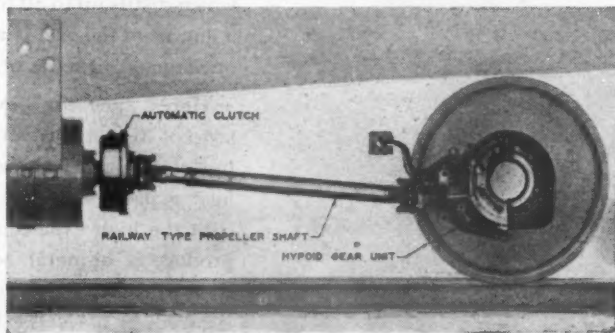
*The Norfolk and Western "Pocahontas"*

THE NORFOLK AND WESTERN "Pocahontas" and "Cavalier" are two of America's crack trains that rely upon Spicer Positive Drives for steady, dependable power delivery to generator units. More than 2000 of these Spicer Drives are in constant daily use on 27 different American railroads, for lighting, air-conditioning and refrigeration equipment.

The Spicer Positive Railway Generator Drive consists of a very simple application of long-lived hypoid gear and pinion mounted on the standard axle. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Automatic Clutch mounted between the generator and the propeller shaft. This automatic clutch completely absorbs all shocks and disconnects the drive line in case of excessive overload, and also completely disconnects the generator drive at speeds below 8 miles per hour, eliminating shock loads when cars are being shunted, also preventing any additional load on the locomotive when starting. It also

automatically permits motoring of generator for electrical inspection, and driving of generator by standby motor.

Spicer Positive Railway Generator Drives can be quickly and economically adapted to new designs and reconditioning jobs. Spicer has 42 years of experience available to help you with your individual drive problems—write for further details and literature.



*Exterior and cross-section view of  
Spicer Positive Generator Drive*

42 YEARS OF

SERVICE

*Positive* Generator Drive

Manufactured, Sold and Serviced by  
Spicer Manufacturing Corporation, Toledo, Ohio

# TUBING THAT SHRUGS OFF SCALE



## A development suggesting a simple means of preventing scale build-up on tubes

**W**ITH THIS TUBING you can boil water off from dissolved solids without evaporator cleaning problems.

Heat Transfer Products, Inc., N. Y. C., originally designed this self-descaling tube\* for their new marine evaporator which distills up to 50 tons of fresh water a day from the sea. It never needs to be opened for scraping or cleaning.

Here's how the new tube works. A strip of Monel is silver-brazed along the top of Admiralty Brass tubing. The low heat expansion of the Monel combines with the high expansion of the brass to produce a bi-metal action of just the right sensitivity. As the tubing heats up, it curves or bows. As the tubing cools, it straightens out again. Result: a tube that shrugs off scale as it works.

Monel was used to team up with brass in this labor-saving tube because it

uniquely supplies all the properties needed. It is highly corrosion-resistant... has 32% lower thermal expansion than brass... is readily silver-brazed... possesses the strength and resilience to take repeated flexings... has good heat transfer properties (important since the strip occupies 20% of the tube area)... and is galvanically compatible with brass.

Thus, once again, an INCO Nickel Alloy has solved a difficult metal problem. Remember this family of alloys whenever you need a metal offering an unusual combination of properties. INCO Technical Service will help you work out specific problems.

For more information on INCO Nickel Alloys or self-cleaning tubes, write: The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

\*U. S. Pat. 2,274,066

**NICKEL INCO ALLOYS**

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KK" MONEL • INCORAL • "Z" NICKEL • NICKEL • Sheet • Strip • Rod • Tubing • Wire • Castings • Welding Rods (Gas & Electric)



*Land Sakes Mary,  
we're in Phoenix already*




You, who design the rail transportation which will compete successfully for tomorrow's travel dollars, know well the proven dependability of V-Belts—of Dayton Railway V-Belts. You know that tomorrow these belts must assume even greater responsibilities.

For tomorrow's rail travel must include comfort, quietness, reliability and *speed*.

The men of Dayton's Railway Division know this too, and they'll be ready to serve you in the future, as in the past, with properly engineered V-Belts for your most exacting needs.

**THE DAYTON RUBBER MANUFACTURING COMPANY**  
DAYTON 1, OHIO

40 years' experience in both natural and synthetic rubber processing



Dayton V-Belt For Drive on Street Locomotive

*Railroad V-Belts by*

**Dayton**  
RED TRUCK MARK THE DAYTON RUBBER MFG. CO.

**Rubber**

THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

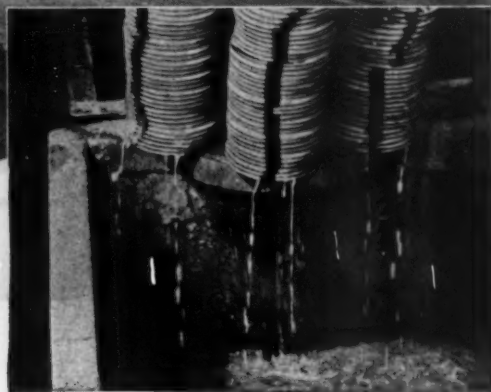
*It's what goes on **INSIDE** that counts*



**Inside an engine, Pedrick  
Silcoating gives extra protection**

TAKE NO CHANCES on new rings that may scratch or scuff the cylinders. Pedrick rings are Silcoated to cushion the cylinder walls against damage during the critical wear-in period. They seat quicker with safety.

Pedrick Silcoated rings are also Heat-Shaped for further wear-in protection. This patented process means correct shape, exact tension, and proper flatness, all of which contribute to quicker, safer seating, and longer, economical service.



Close-up of rings coming out of Silcoating treatment

Today, when aging diesel-driven locomotives and yard equipment must put in hours of overtime, Pedrick *precisioneered* piston rings maintain increased power and compression with longer periods between overhauls. Use Pedrick rings for compressors and air brake equipment, too.

WILKENING MANUFACTURING Co., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co., (Canada), Ltd., Toronto.

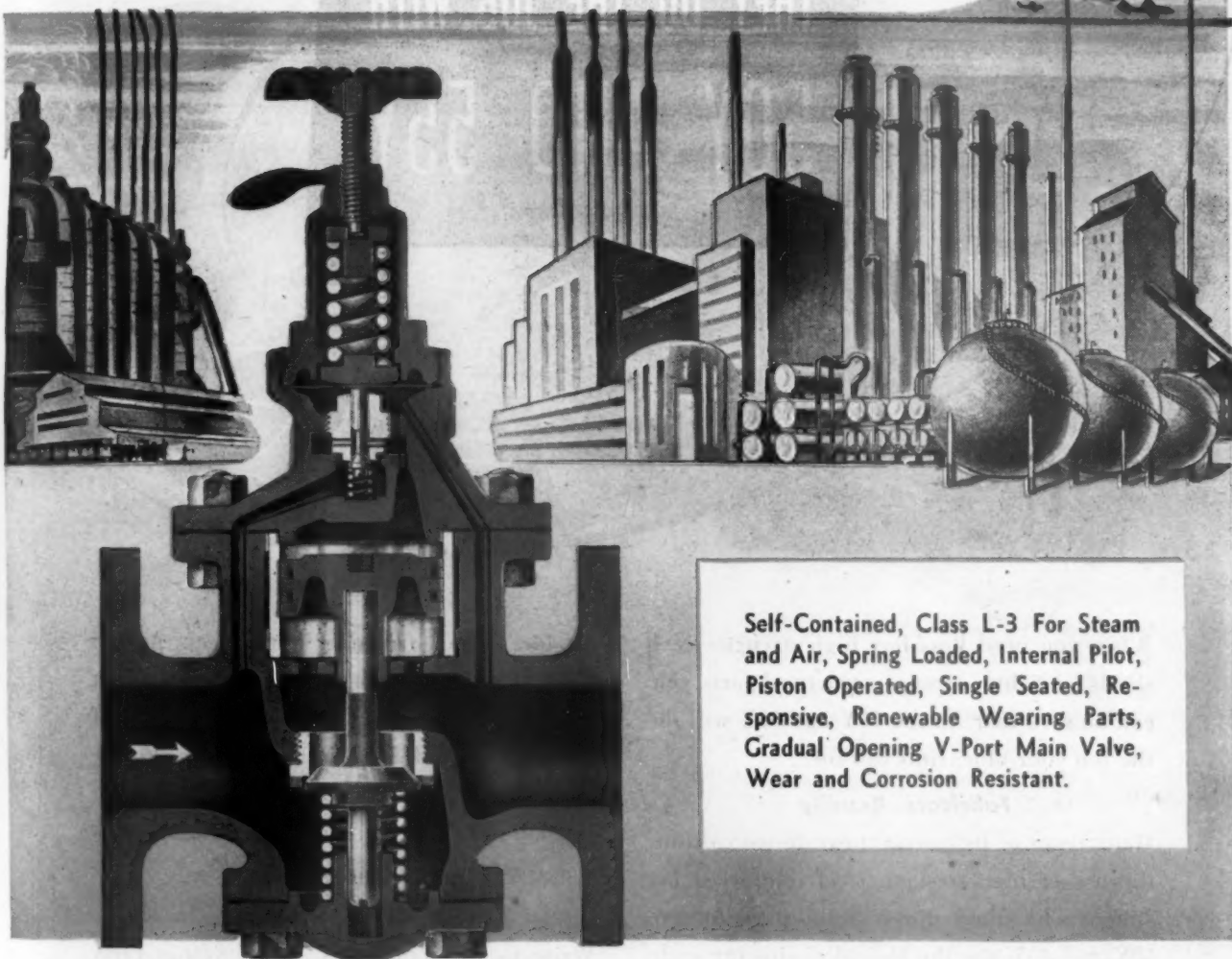
NOW THAT YOU'VE GIVEN TO THE RED  
CROSS, INVEST IN MORE WAR BONDS

**Pedrick**

*precisioneered* **PISTON RINGS**

RAILWAY MECHANICAL ENGINEER

# TODAY, INDUSTRY NEEDS THIS *BETTER* PRESSURE REDUCING VALVE



Self-Contained, Class L-3 For Steam and Air, Spring Loaded, Internal Pilot, Piston Operated, Single Seated, Responsive, Renewable Wearing Parts, Gradual Opening V-Port Main Valve, Wear and Corrosion Resistant.

LESLIE Pressure Reducing Valves have been working for the railroads since 1900. They will be found on all types steam passenger locomotives, in power houses, in the back shops and in terminal steam and air lines.

There is one outstanding reason for the preference of railroad mechanical department officers in their selection of LESLIE Regulating Valves — the first one was designed by a Master Mechanic for a specific railroad shop job. While many improvements have been made, the basic principle of operation is the same. It was perfect and fool-proof.

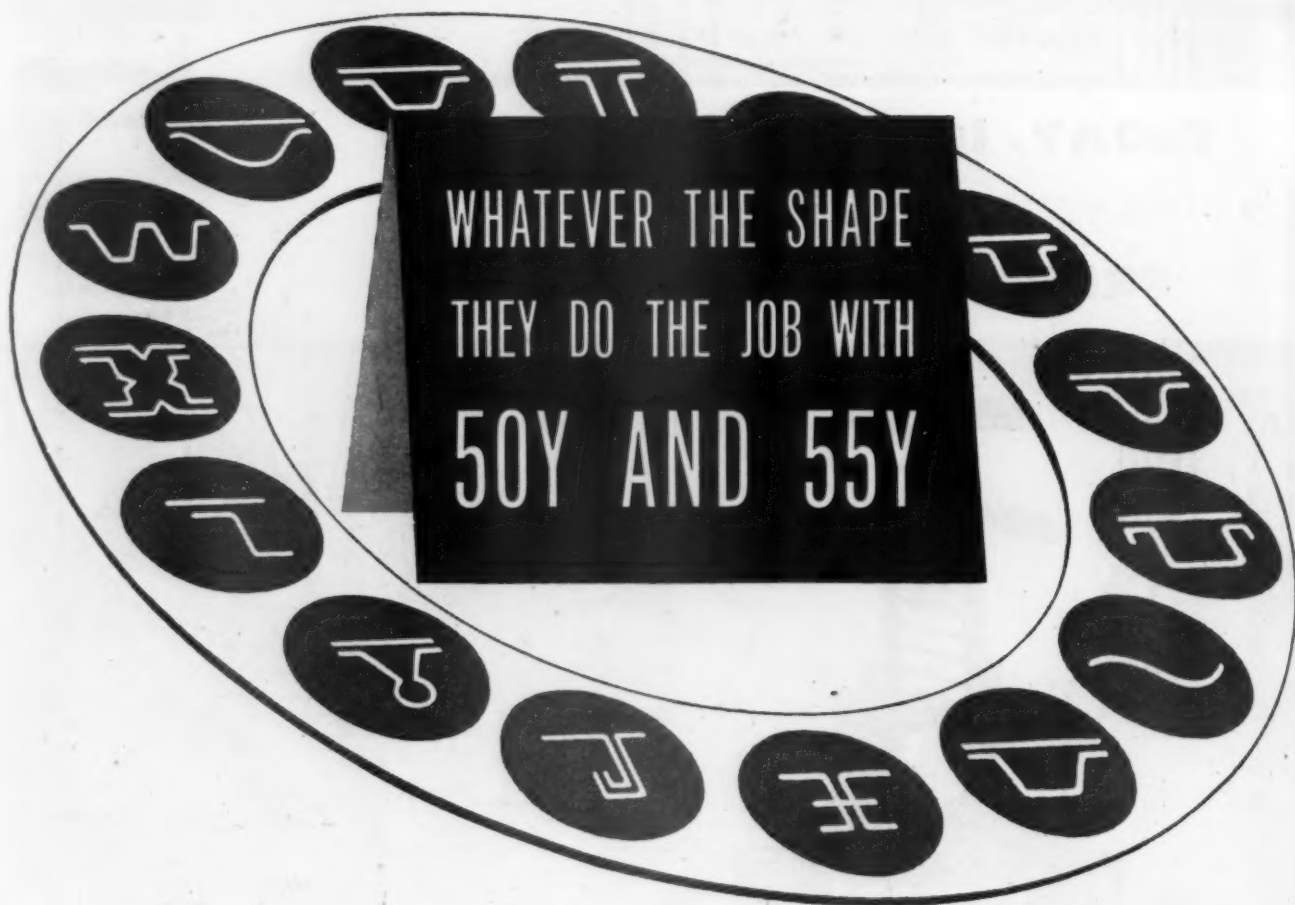
Year in year out dependable performance can be proven by thousands of pressure recording charts. They tell a

story replete with efficiency and economical performance. Yes! the railroad industry can well afford to standardize on the economies assured by the use of LESLIE Pressure Reducing Valves. They are designed and built for the job.



LESLIE CO., LYNDBURST, NEW JERSEY





When you need low-alloy high strength steel sheets for lighter, stronger structural parts, you can be sure that ARMCO 50Y and 55Y will do the job your blueprints call for.

***Fabricate Readily***

Many types of light-weight car design call for the use of high strength steel reinforced by stiffeners like those shown on this page. ARMCO 50Y and 55Y are the logical choice for such designs, because they fabricate so readily. Their high yield strength is obtained by chemistry without sacrificing ductility.

For other uses, lighter than conventional gages can be used without reinforcement of any kind.

Besides these structural advantages, ARMCO Low-Alloy High Strength Steels have excellent welding properties. Corrosion resistance of ARMCO 50Y and 55Y is considerably greater than that of ordinary steel. Where extra rust resistance is needed, zinc or aluminum coatings can be applied.

***Ask for More Data***

Write us for complete data on ARMCO Low-Alloy High Strength Steels. It may help you design new or improved structural parts that have less weight and greater efficiency. Armco Railroad Sales Co. Inc., 1111 Curtis Street, Middletown, Ohio.

**ARMCO RAILROAD SALES CO. INC.**



# *This Baffle Construction is* **WEATHERPROOF**

It Keeps Out

**RAIN**

**SNOW**

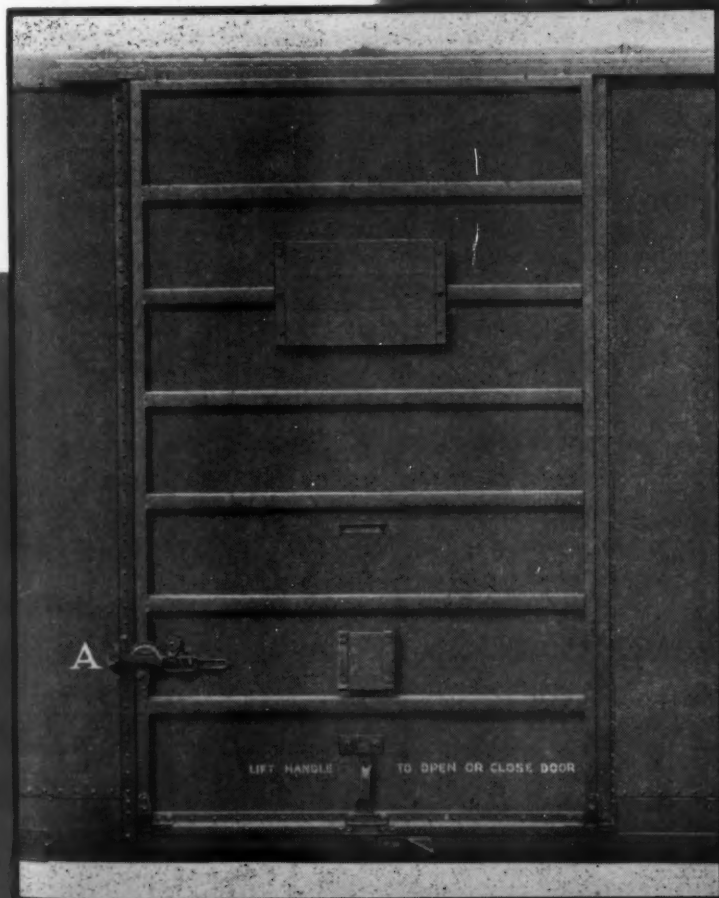
**DUST**

**CINDERS**

*...reduces  
damage  
claims*



*THIS WEDGING  
HANDLE KEEPS THE  
DOOR TIGHTLY CLOSED*



## **SUPERIOR CAR DOORS**

- RIGID CONSTRUCTION
- LIGHT WEIGHT
- LONG LIFE
- WEATHER PROOF
- FREE ROLLING
- NO SLAMMING

**SUPERIOR CAR DOOR COMPANY**  
**MCCORMICK BUILDING • CHICAGO**

# TOUGH TEST FOR N.B.M. BEARINGS



**W**hen Winter's bitter blasts chill lubrication, N-B-M Bearings show the stuff they're made of... tough enough to overcome common winter failures and to keep operating efficiently in coldest weather.

Summer's ahead now, but it pays to remember that another winter will be coming soon. In winter blast or summer heat, N-B-M Bearings will ease your "weather worries" and give you maximum operating efficiency.

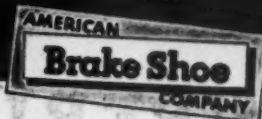


**N • B • M**  
JOURNAL AND ENGINE BEARINGS

## NATIONAL BEARING

D I V I S I O N

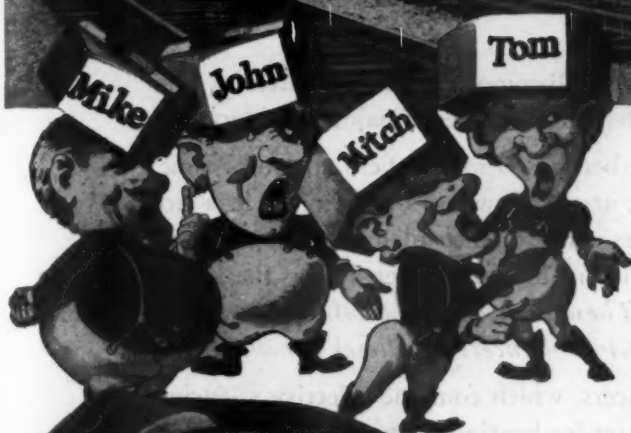
ST. LOUIS • NEW YORK



PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.



# O.K.



## *The Little Brothers O'Kay*

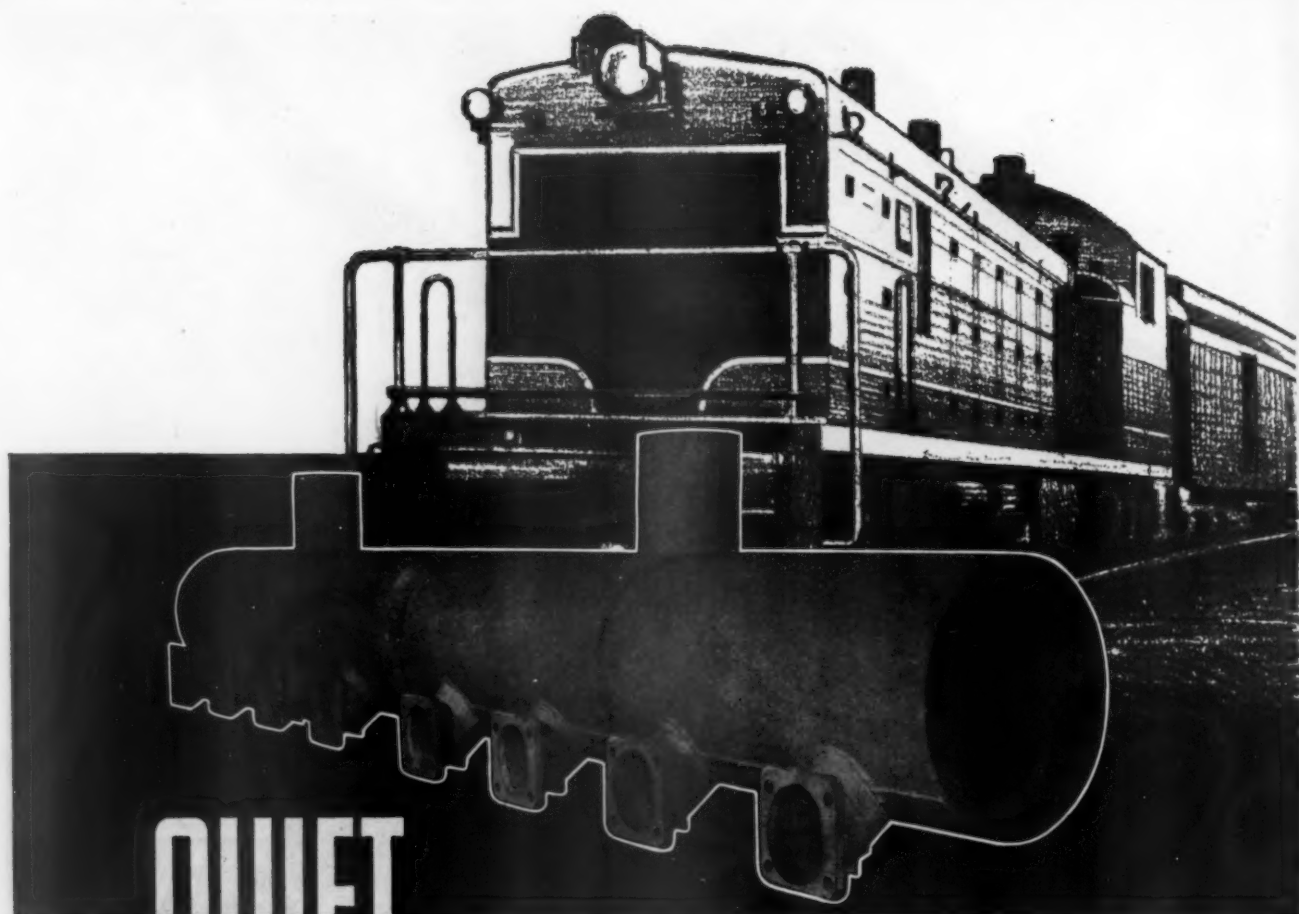
- There are four little Elves who are proud of themselves  
They are called Little Brothers O'Kay  
For in sunshine and rain, they ride with the Train  
To make sure each nut is O. K.  
(For safety, nuts *must* be O. K.)
- The Elves leap with glee as the Grip Nuts they see  
These Grip Nuts that grip tight and stay.  
While marching along, the Elves sing a song  
"They're O. K.—They're O. K.—They're O. K."  
(Yes, Grip Nuts are truly O. K.)

# GRIP NUT COMPANY

310 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

808

REGIONAL OFFICES: ST. PAUL — MINNEAPOLIS — ST. LOUIS — SAN FRANCISCO — CHICAGO — CLEVELAND — SALT LAKE CITY — SALISBURY, N. C. — PITTSBURGH — NEW YORK



## QUIET QUILT WORKER

With the increased use of Diesel power in locomotives, both switching and main line, the problem of adequate silencing becomes a major consideration.

The conventional Maxim silencers have been used in this field for some time, with the additional protection of spark arresting where operation is in a fire hazard area such as the case of refineries, or ordnance plants. A more recent development, however, the Maxim exhaust manifold silencer, brings the added advantage of substantial saving in space. *These silencers replace the conventional exhaust manifold and at the same time act as silencers of Diesel exhaust noise.*

Maxim also makes Heat Recovery Silencers, which combine effective silencing with the production of hot water or steam for heating purposes. Wide interest has been shown in this practical method of utilizing exhaust heat, normally wasted, to produce usable steam or hot water. Our engineering Department will be glad to work with you on possible applications to the railroad field. Heat Recovery Silencer Bulletin WH-101 will be sent to you on request.



# MAXIM



THE MAXIM SILENCER CO. • 65 HOMESTEAD AVE., HARTFORD, CONN.

# SPEED NUTS OVER TOKYO



Boeing uses thousands of SPEED NUTS on every B-29 Superfortress to make them lighter, faster and deadlier.



Photos courtesy of Boeing Aircraft Company



**SPEED NUTS HELP THESE BOEING WORKERS BOOST B-29 PRODUCTION**

**TINNERMAN PRODUCTS, INC.**

2029 Fulton Road, Cleveland 13, Ohio

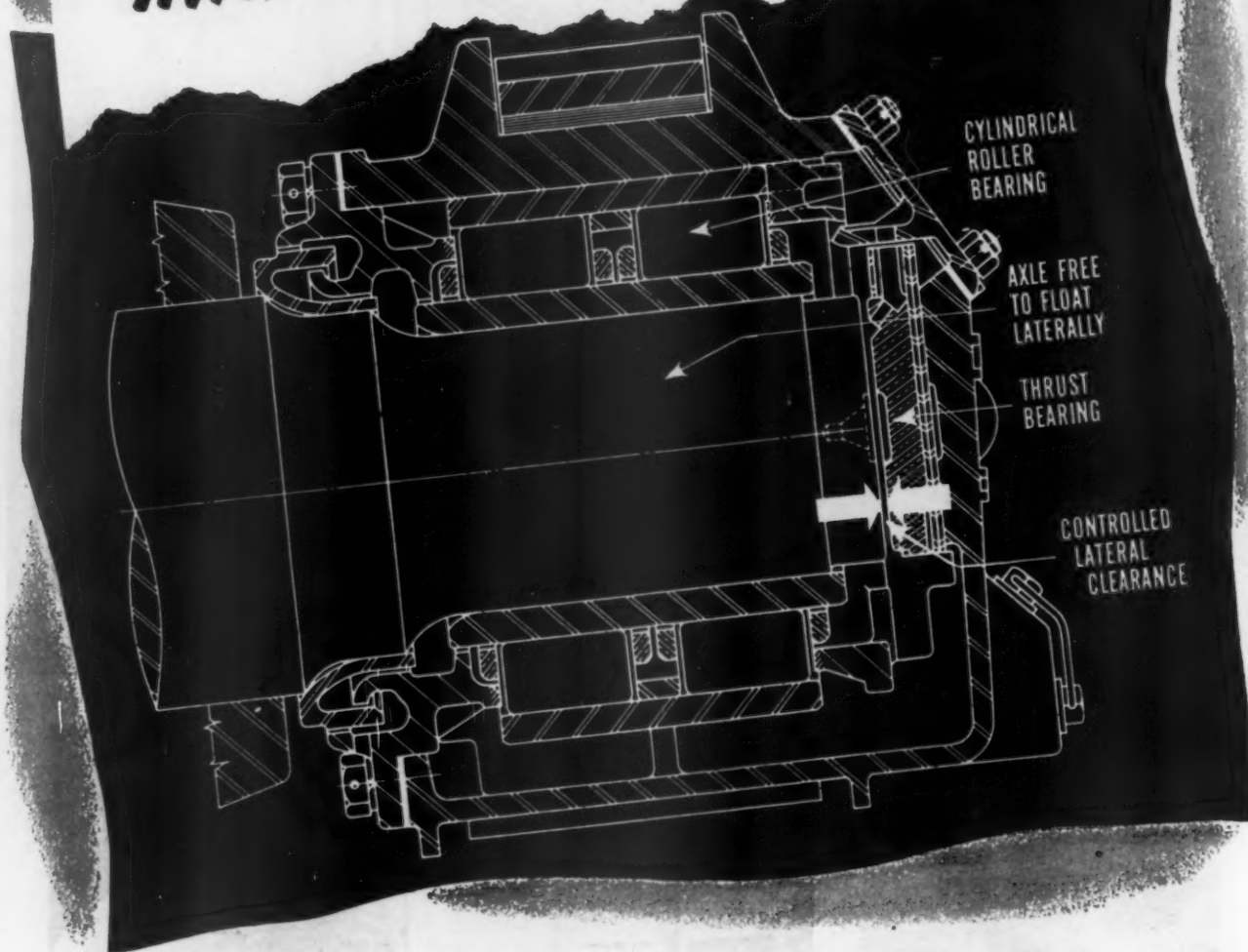
In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario

In England: Simmonds Aerocessories, Ltd., London

**Speed Nuts**  
PATENTED \* Trade Mark Reg. U. S. Pat. Off.  
**FASTEST THING IN FASTENINGS**



# AN OUTSTANDING FEATURE OF *HYATT JOURNAL BOXES*



—is that freedom of lateral movement of axles and wheels deliberately provided for. The sidewise movement, or travel, of the axles through the cylindrical roller bearings which carry radial loads only, is closely controlled between independent thrust bearings of special analysis bronze. Hence, the effect of track irregularities is minimized thus promoting that ease of riding and passenger comfort which is so typical of Hyatt equipped cars.

Another important advantage of this construction is increased wheel flange life, also due to the lateral float of the axle resulting in decreased maintenance.

Millions of miles of operation have proved the correctness of this arrangement for passenger train installations.

**HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION**

Harrison, New Jersey

Chicago

Detroit

Pittsburgh

Oakland, California

**A SQUARE-SHOOTING  
LABOR POLICY STANDS BEHIND  
SYMINGTON-GOULD PRODUCTS . . . .**



**FOR RETURNING VETERANS**

A warm welcome and a genuine personal interest in his re-employment awaits every qualified former employee who desires to return to Symington-Gould from military service. The Company's Personnel Department makes a study of each veteran's qualifications, after which he is reinstated in accordance with his rights as established by the Selective Training and Service Act. If possible he is placed in a more important position in recognition of new skills acquired while in the Armed Services. Veterans, not previously employed by Symington-Gould, are given special consideration. Every effort is made to place them in positions suitable to their condition and ability.

**FOR ALL EMPLOYEES . . .**

To promote and improve industrial and economic relations between labor and management is one of this Company's foremost aims. To this end the Management of Symington-Gould seeks to provide:

a wage level as high as competitive conditions permit; an opportunity for increased earnings through increased productive effort; adequate machinery for bargaining collectively with representatives of a majority of employees; equal opportunity regardless of race, color or creed; and above all, the opportunity for advancement to those employees who meet high standards of workmanship.

**THE SYMINGTON-GOULD CORPORATION**

Works ROCHESTER & DEPEW, NEW YORK

New York • Chicago • St. Louis • Baltimore • Boston • San Francisco • In Canada: ADANAC SUPPLIES, LTD., Montreal, Que.





# JESSE JAMES

## HAD A HORSE!

● The old-timers were pikers. Today's train robbers rob a twelve-car train of two whole revenue-producing cars...

*Simply by holding up the locomotive and taking up to 800 hp. away from it—for air-conditioning and electric services.*

Stop this modern train robber. Get rid of the power parasites—those systems that depend on locomotive power source, either direct or indirect. Equip your cars with Waukesha independent, engine-driven equipment.

There's no parasite load—all the locomotive's horsepower is available to pull the train. Waukesha engine-driven units completely take over—supply modern deluxe air-conditioning and lighting *on demand*, independent of locomotive, train movement, car location and stand-by service.

Get the facts from any user.

Refrigeration Division

### WAUKESHA MOTOR COMPANY

WAUKESHA • WISCONSIN

**Largest Builders of Mobile Engine-Driven Refrigeration and Generator Equipment**



# PHILCO

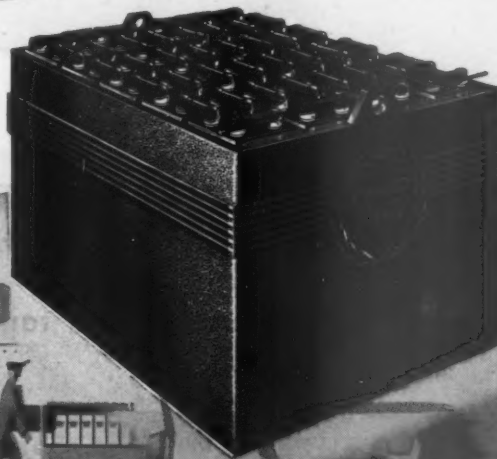
gives you the latest in  
Modern Battery  
Design !

THOUSANDS of electric industrial trucks are now getting more work done at lower cost because of the advanced research of Philco engineers in developing tougher, more powerful storage batteries. Philco has long led in providing batteries of maximum capacity, with the rugged long-life construction especially engineered for today's heavier work schedules.

Now Philco engineering leadership is demonstrated anew with the storage battery that gives 30% longer life —the great new Philco "Thirty"! For lower cost in handling materials with electric trucks, be sure to include the new Philco "Thirty" in your plans. Now available in preferred types. Complete information gladly sent on request. PHILCO CORPORATION, Storage Battery Division, Trenton 7, New Jersey.

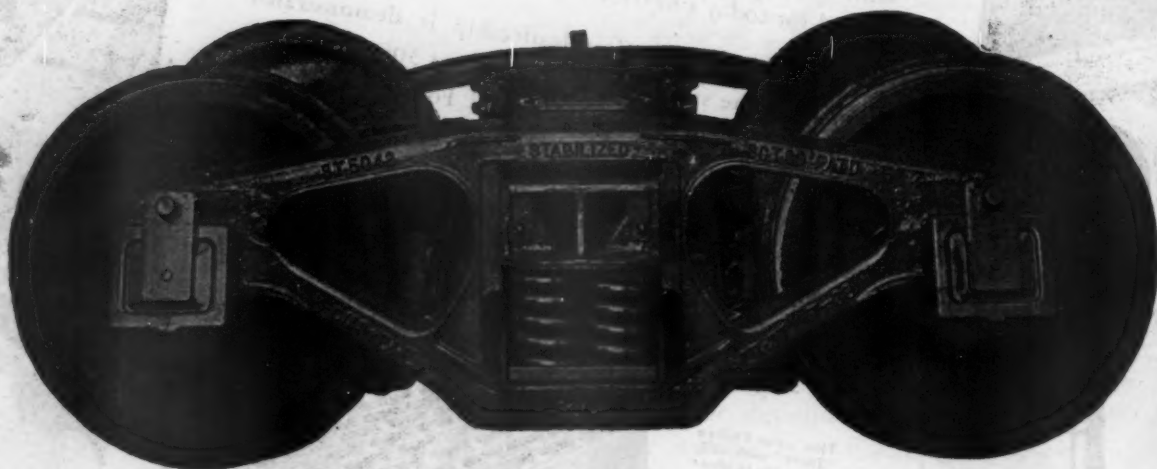
For 50 years a leader in Industrial Storage Battery Development

The new Philco "Thirty" with 30% longer life is identified by its distinctive connectors.





**Greater Protection for Lading,  
Equipment and Track with**



# **Barber Stabilized Trucks**

**Selected for over 92,000 cars by 55 railroads and private car lines.**

**STANDARD CAR TRUCK COMPANY**  
332 SOUTH MICHIGAN AVENUE CHICAGO 4, ILLINOIS



*"Tension  
there in  
spite of  
wear"*

**LOCOMOTIVE HY-CROME SPRING WASHER**

**There's  
more here  
than meets  
the eye!**

**EATON**

**EATON MANUFACTURING COMPANY**

**MASSILLON, OHIO**

*Reliance Division*

**Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal**

• It looks like a **SPRING WASHER** . . . it feels like a **SPRING WASHER** . . . but can you rely on it to perform efficiently and economically as a **SPRING WASHER**?

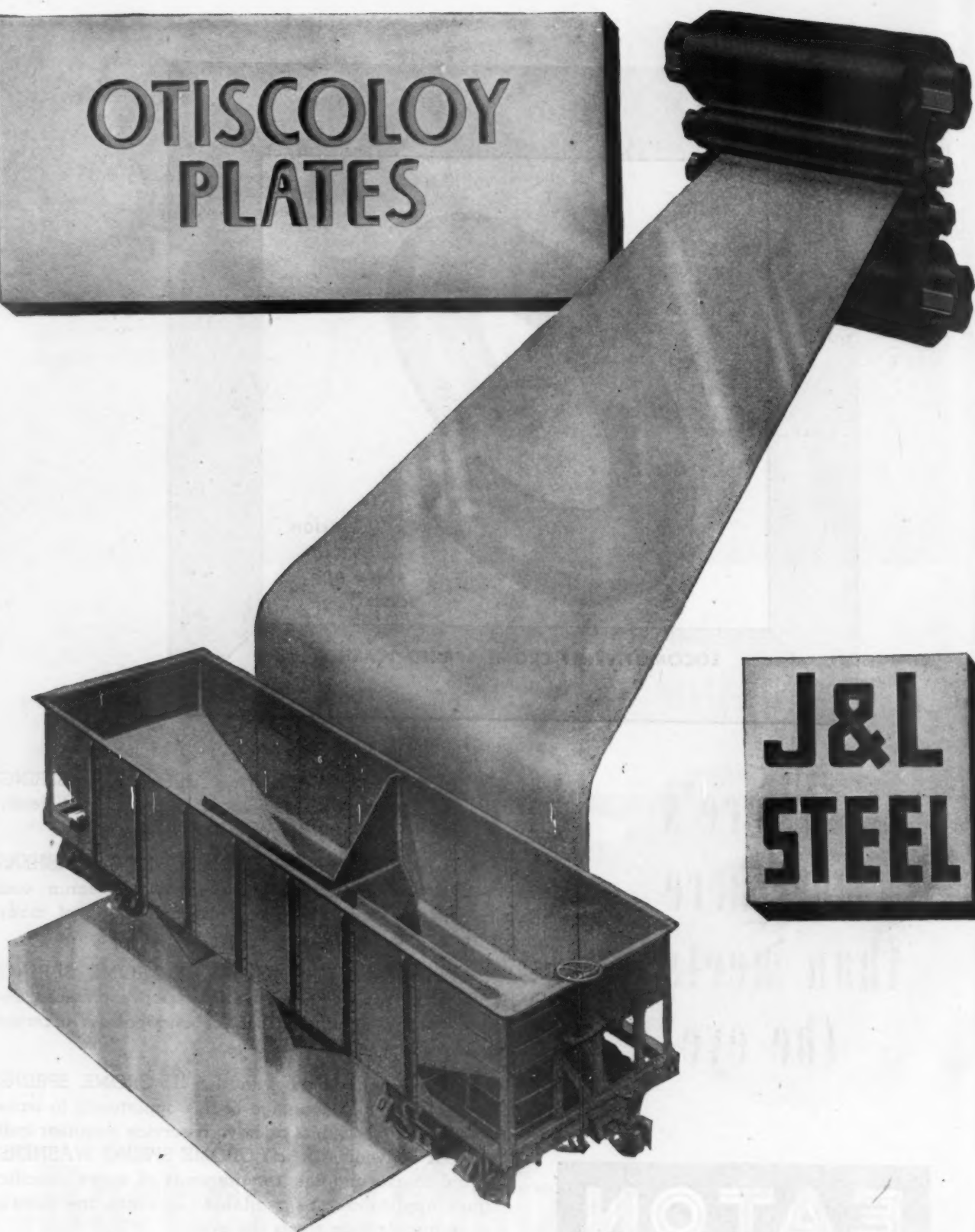
• **RELIANCE HY-PRESSURE HY-CROME SPRING WASHERS** have been developed only after laboratory research and exhaustive field tests with the helpful cooperation of many railroad users.

• Today **RELIANCE HY-PRESSURE HY-CROME SPRING WASHERS** exceed all requirements for reactive pressure, reactive range and non-fatiguing service and possess inherent qualities not evident to the naked eye.

• If you are not acquainted with the **HY-CROME SPRING WASHER FAMILY** take advantage of this opportunity to write for descriptive folders or have a service engineer call at your convenience. **HY-CROME SPRING WASHERS** equal to meeting the requirements of every specific track application are available. In every one there's more quality than meets the eye.



# OTISCOLOY PLATES



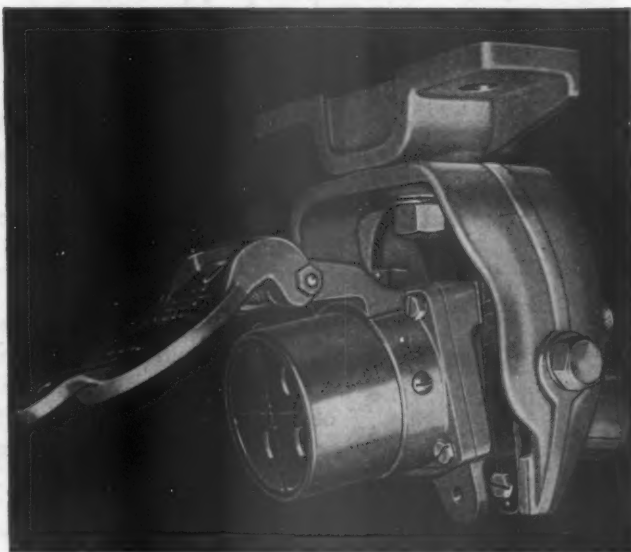
**J&L  
STEEL**

A J&L Controlled Quality Steel of high tensile strength, but with adequate ductility and impact properties. Resists abrasion and corrosion. Lends itself to hot and cold working, particularly to welding. Affords weight reduction and long wear and service. OtiscoLOY available in both sheets and plates for a wide variety of applications.

**JONES & LAUGHLIN STEEL CORPORATION**  
PITTSBURGH 30, PENNSYLVANIA

# SAFE HANDLING

## for Air Conditioning and Battery Charging Service



QuelArc plugs and receptacles are built to withstand the severe conditions common to yard and terminal service. QuelArc plugs are available in cast metal or all-insulated types, with these proved QuelArc features: smooth exterior shaped for a firm hand grip; ground protection; standard wiring lugs; strain relief cord grip. Contacts and other parts are interchangeable.

The QuelArc universal swivel car receptacle is designed to reduce wear and tear on plugs and cable, and to prevent the hazard of a flying cable attached to a moving train. Free movement of this receptacle, both horizontally and vertically, insures that the plug will pull straight out. If the car is moved, the cable and plug remain attached to the terminal outlet and pull out of the car receptacle. A battery

charging receptacle of similar design is also available.

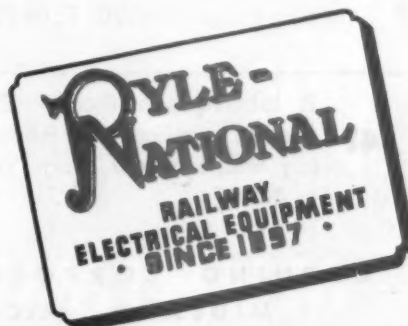
Pylet catalog 1100 contains listings of the complete line of air conditioning and battery charging plugs and receptacles.

### THE PYLE-NATIONAL COMPANY

1334-58 North Kostner Ave. Chicago 51, Illinois

Offices: New York, Baltimore, Pittsburgh, St. Louis, St. Paul, San Francisco

Export Department: International Railway Supply Co., New York  
Canadian Agents: The Holden Co., Ltd., Montreal



HEADLIGHTS • TURBO-GENERATORS • CONDUIT FITTINGS • FLOODLIGHTS • MULTI-VENT



**DOW CORNING, first in silicones,**  
**is fully equipped with new plant and facilities for**  
**the production and distribution of an expanding line of silicone products**

American industry has been quick to utilize the new Dow Corning Silicones—to see the potentialities inherent in their higher order of heat stability, chemical inertness, water resistance, and dielectric properties. Dow Corning is now supplying, directly or through selected distributors, the following silicone products:



#### **FLUIDS**

Water-white, odorless, inert Silicone Liquids . . . notable for their low rate of viscosity change over a wide temperature range, low vapor pressure, water repellency, and good dielectric properties.



#### **993**

Insulating Varnish . . . recommended because of its extreme heat stability for impregnating, coating and bonding, and waterproofing inorganic insulating materials such as asbestos, mica, and Fiberglas cloth, tape, and sleeving. Other special purpose silicone resins and compounds are available.



#### **4**

Ignition Sealing Compound . . . an easily applied silicone waterproofing compound having excellent dielectric properties, corona resistance, and the consistency of petroleum jelly. It neither hardens nor melts at temperatures ranging from  $-40^{\circ}\text{F.}$  to  $400^{\circ}\text{F.}$



#### **STOPCOCK GREASE**

A chemically resistant Silicone Grease for lubricating stopcocks and other ground glass joints.



#### **7**

Special Low Temperature Compound . . . an oxidation resistant lubricant and sealing compound developed for use at temperatures as low as  $-70^{\circ}\text{F.}$



#### **PLUG COCK GREASE**

A Silicone Grease that affords easy operation of lubricated plug valves over wide temperature ranges in most difficult services.



#### **31**

A lubricating Silicone Grease for special applications in the temperature range of  $-70^{\circ}\text{F.}$  to  $190^{\circ}\text{F.}$



#### **41**

A lubricating Silicone Grease for special applications where operating temperatures range from  $0^{\circ}\text{F.}$  to  $400^{\circ}\text{F.}$

**DOW CORNING CORPORATION**  
**MIDLAND, MICHIGAN**  
ADDRESS ALL INQUIRIES TO BOX 592





# LATEST REPORT

## ON AMERICA'S FIRST ALUMINUM BOXCAR

Built by Great Northern with Alcoa Aluminum

### CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

# WESTERN UNION

1301

(54)

### SYMBOLS

DL = Day Letter  
NL = Night Letter  
LC = Deferred Cable  
MLT = Cable Night Letter  
Ship Radiogram

A. M. WILLIAMS  
PRESIDENT

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MA77 49 SER-MINNEAPOLIS MINN 26 1135A 1945 FEB 26 PM 12 59

J O CHESLEY=

ALUM CO OF AM 801 GULF BLDG PGH=

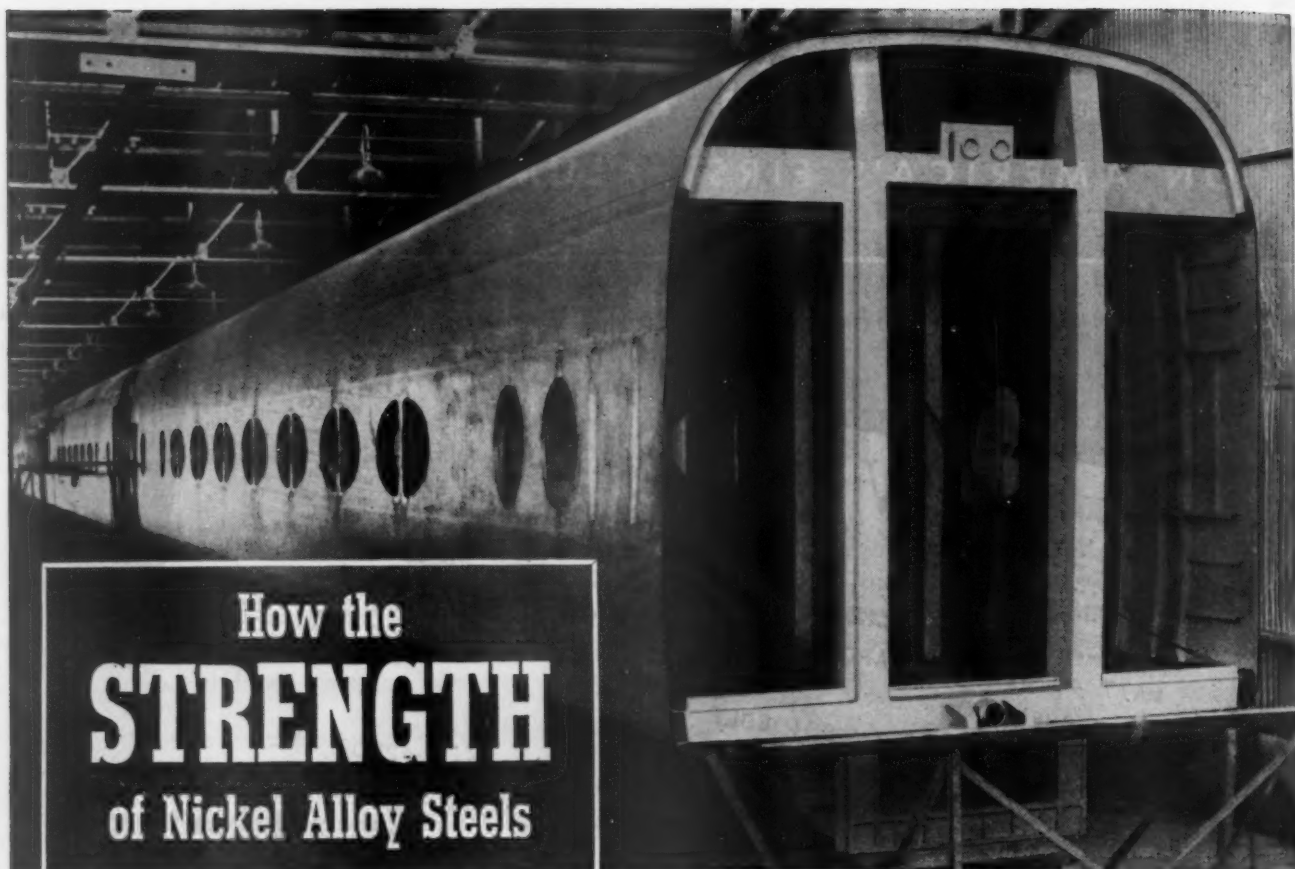
GREAT NORTHERN EXPERIMENTAL ALUMINUM BOX CAR #2500 THE FIRST ALUMINUM BOX CAR IN AMERICA HAS JUST COMPLETED 90 DAYS SERVICE OF WHICH 73 DAYS WERE ON FAST PASSENGER TRAINS BETWEEN CHICAGO TWIN CITIES AND WEST COAST. TOTAL MILEAGE 40000 MILES. USED TO CARRY SPECIAL EXPRESS. INSPECTION SHOWS CONDITION PERFECT=

E T HUTCHINSON.



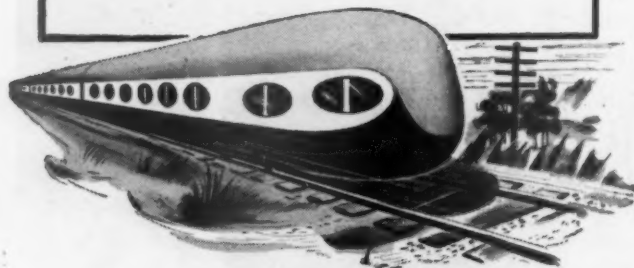
# ALCOA FIRST IN ALUMINUM





## How the **STRENGTH** of Nickel Alloy Steels

improves new types  
of rolling stock



*Road test results have proved that smooth riding qualities can be attained without heavy equipment. The high strength/weight ratios of nickel alloy steels permit considerable safe weight reduction in this new type easy riding car.*

**S**uperlative comfort at all speeds...remarkable stability at 100 miles per hour...freedom from vibration...economy in weight...

These characteristics of tomorrow's railway car are exemplified in the new type de luxe coach built by Preco, Inc.

Only a few have been in operation during the past three war-years, but the development is expected to have important influence on future car construction.

Weight reduction...considerable and safe...is effected through use of high strength, low alloy nickel steels.

The entire sides and roof assemblies are fabricated of "Yoloy" a nickel-copper steel...strong, elastic, weldable and corrosion-resistant...produced by Youngstown Sheet and Tube Company.

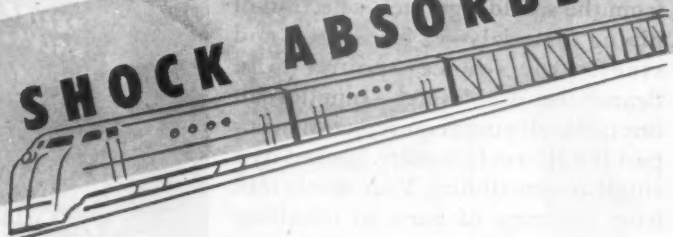
Floors and center sills are built of "18-8" stainless steel sections. Buffer stems and draft stops are cast of nickel-molybdenum steel, normalized and drawn at 1200° F., supplied by Warman Steel Casting Company.

One of the alloys containing nickel may help you reduce bulk and deadweight safely...and to combat wear and corrosion. We invite consultation on the use of Nickel or Nickel alloys in your equipment.

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET  
NEW YORK 5, N.Y.

# Tomorrow's

MODERN SHOCK ABSORBER



## For Today's Freight Car Rehabilitation Program

By controlling dangerous and destructive vibration the new Monroe Airplane Type Hydraulic Shock Absorber for freight car trucks minimizes vertical and swaying action . . . protects lading, equipment and roadbed . . . reduces maintenance costs and damage claims . . . and keeps capacity pay-load cars working longer.

Especially designed for freight car trucks, the new Monroe Airplane Type Hydraulic Shock Absorber embodies the same exclusive Monroe

Hydraulic Shock Absorber principles which have proved economical, efficient and dependable over millions of trouble-free railway passenger car miles.

With no holes to drill, the new Monroe Airplane Type Hydraulic Shock Absorber is easily and quickly installed. It replaces one of the springs in the cluster and *fits right in* . . . quickly pays for itself and shows added profits through savings.

*Our engineers will gladly work with you in the application of this modern new Monroe Airplane Type Hydraulic Shock Absorber for the rehabilitation of your freight cars.*

RAILWAY SUPPLY DIVISION



In use since 1938 on high speed crack streamliners, Monroe Airplane Type Hydraulic Shock Absorbers have smoothed the ride and saved thousands of man hours' maintenance time. They demonstrate the soundness of exclusive Monroe Hydraulic Shock Absorber principles.

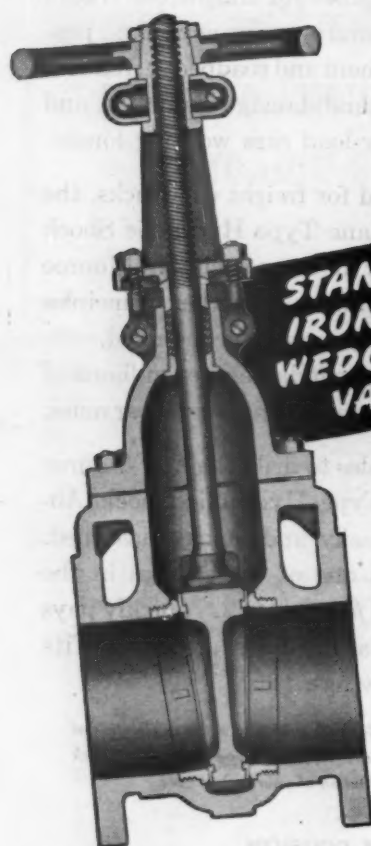


# DEPEND ON CRANE . . . WHEN IT'S PIPING EQUIPMENT YOU NEED

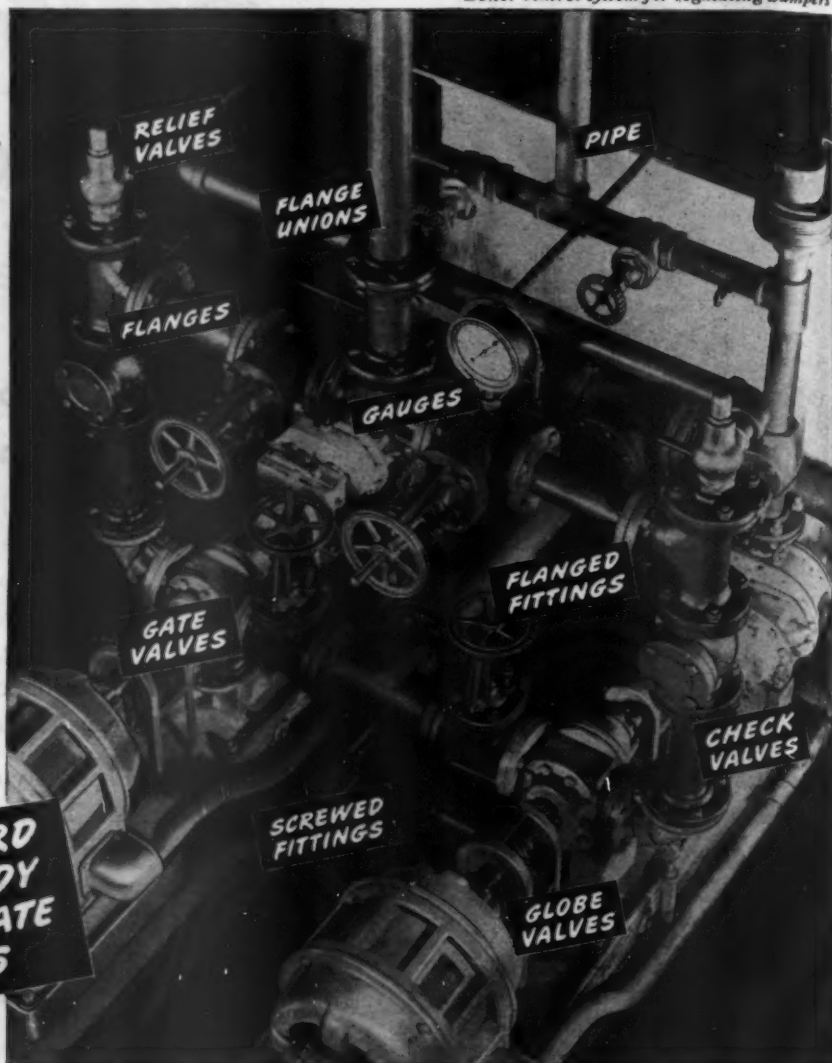
ONE SOURCE OF SUPPLY • ONE RESPONSIBILITY FOR ALL PARTS • ONE STANDARD OF QUALITY

To keep piping at its best, to simplify and speed up deferred replacements—call on the Crane line. You choose from the world's greatest selection of piping materials—in brass, iron and steel. One source—your Crane Branch or Wholesaler—supplies on one order all your requirements. Every part is uniform in quality, backed by a single responsibility. Your whole task from ordering of parts to installing them is simplified—and at the same time you are benefiting by Crane Co.'s 90-year leadership in the field of piping materials. Below is an example of Crane complete lines—in Standard Iron Body Wedge Gate Valves.

*Boiler control system for regulating dampers*



**STANDARD  
IRON BODY  
WEDGE GATE  
VALVES**



**SERVICE RECOMMENDATIONS:** Crane Standard Iron Body Wedge Gate Valves with Brass trim are recommended for steam, water or oil lines; all-iron valves for oil, gas or fluids that corrode brass but not iron. Made in O.S.&Y. and Non-rising Stem patterns.

## Working Pressures

Size of Valve	Screwed or flanged end valves		Hub end valves
	Saturated Steam	Cold water, oil or gas, non-shock	Cold water or gas, non-shock
2 to 12 in.	125 pounds	200 pounds	200 pounds
14 & 16 in.	125 pounds	150 pounds	150 pounds
18 to 24 in.	*	150 pounds	150 pounds

\*For steam lines larger than 16-in., Crane 150 pound Cast Steel Gate Valves are recommended. (For sizes under 2 in., use Crane Clamp Gate Valves.)

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. • Branches and Wholesalers Serving All Industrial Areas

# CRANE

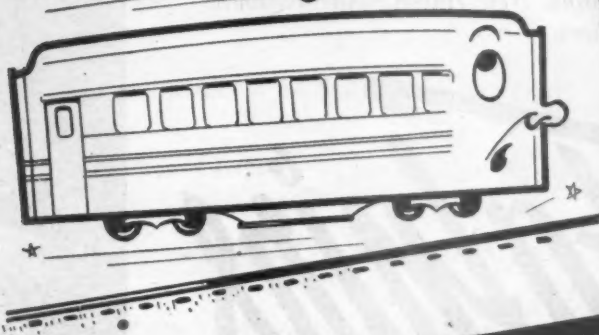


**VALVES • FITTINGS • PIPE  
PLUMBING • HEATING • PUMPS**

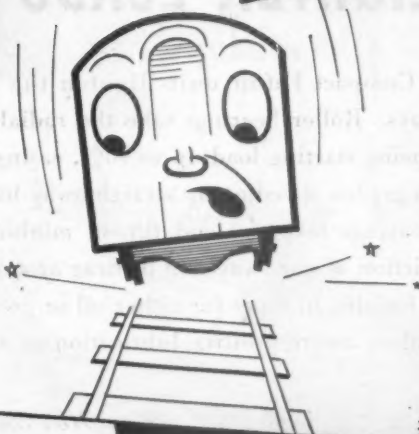
LATERAL CONTROL?  
VERTICAL CONTROL?

**HOUDAILLE** has *Both*

for the  
**UP AND DOWN  
JOUNCE**



for the  
**SIDE to SIDE  
LURCH**



The "up and down jounce" is one thing. The "side to side lurch" is another.

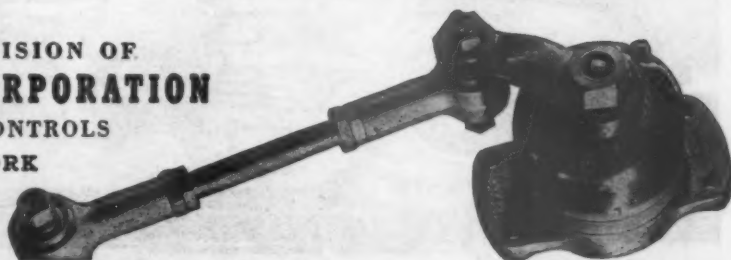
Houdaille\* has vertical and lateral Hydraulic Shock Absorber installations for controlling both movements. Control can be double-acting or "one-way" to meet specific conditions.

Since 1934 when the world's first streamline train pioneered the use of Houdaille railroad instruments, our engineers, drawing upon experience covering scores of different types of hydraulic applications in many fields, have designed equipment for the country's most famous trains. In many cases this equipment has seen more than a million miles of service.

Improved Houdaille railroad instruments are now ready for post-war planning. Ask us about them.

\*Pronounced—Hoo-dye

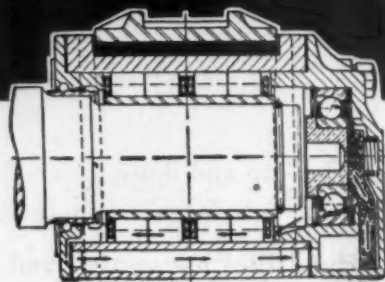
HOUE ENGINEERING DIVISION OF  
**HOUDAILLE-HERSHEY CORPORATION**  
MAKERS OF HYDRAULIC CONTROLS  
BUFFALO 11, NEW YORK



You can add an important modern feature to present passenger cars without duration delay. Fafnir Ball and Roller Journal Bearings are available now – the same as used on the crack trains of North Western, Rock Island, Reading, New Haven, and Southern, among others.

# Fafnir<sup>6</sup>

## LIGHTEN LOADS – TWO WAYS!



Compact Fafnir units lighten the load two ways. Roller bearings take the radial load, reducing starting load up to 90%, easing the pull on grades, speeding up straightaway hauls. Ball Bearings take the end thrust, minimizing the friction of car sway and of drag around curves.

Fafnirs, in types for either oil or grease lubrication, assure positive lubrication at all speeds.

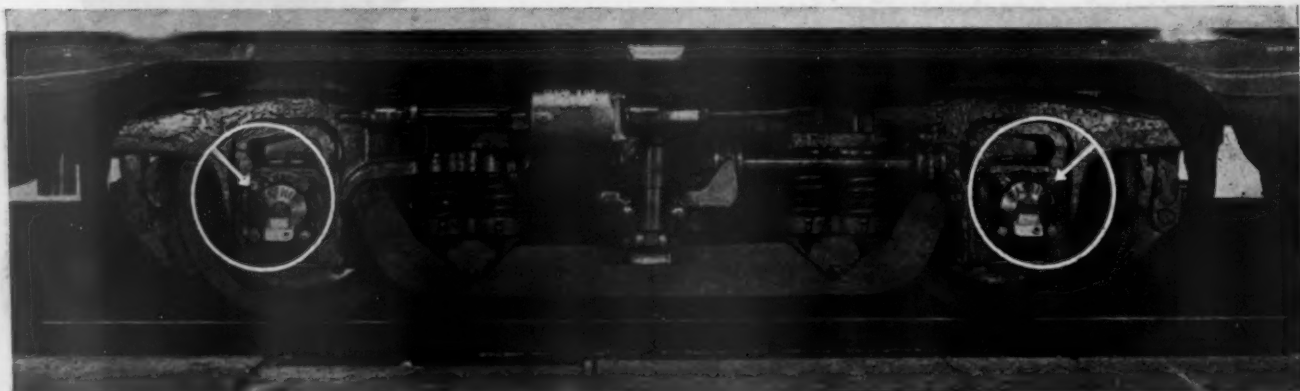
They effectively seal out water and dirt – cut maintenance costs to the bone! They are easily applied to standard AAR pedestal openings. Fafnirs have amply proved their long-life service with performance records of over 2,000,000 miles – and still going strong! Write for full information and engineering cooperation. The Fafnir Bearing Company, New Britain, Connecticut.

Buy War Bonds



and Stamps

**FAFNIR BALL & ROLLER JOURNAL BEARINGS**  
REDUCE STARTING LOADS UP TO 90% • • • CUT MAINTENANCE TWO-THIRDS





# Ride-Control

**GETS ALL THE "GIVE"  
FROM COIL SPRINGS!**

Coil springs give a smooth, easy ride when used with the A.S.F. Ride-Control Truck (A-3). They develop their best riding qualities because the unique principle of constant friction that controls them does not perceptibly interfere with their softness when absorbing impact—does not materially affect their cushioning qualities. It *does* enable coil springs to develop their best riding qualities.

THE TRUCK FOR TODAY'S NEED . . . TOMORROW'S SPEED!



LONG SPRING TRAVEL

CONSTANT FRICTION CONTROL

**AMERICAN STEEL FOUNDRIES**

CHICAGO

BEST-MADE OF  FINE CAST STEEL



# FOR THE ARTERIES OF PRODUCTION

THE ALMOST INDISPENSABLE

# BARCO

FLEXIBLE JOINTS

Fluids—oil, gasoline, water, steam—are the very life-blood of America's vast production program. And everywhere throughout industry and transportation, Barco Flexible Joints protect the arterial system which conveys these liquids and gases against vibration, impact and shock. For over 30 years, Barco has led in its field...developing flexible joints for every need. Write for catalogue to the Barco Manufacturing Company, Not Inc., 1808 Winnemac Avenue, Chicago, 40, Ill.



Not just a swivel joint...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.



## The Harder the Service the "Harder" ROL-MAN Becomes

Abrasion, impact and pressure, cold work-harden the surface of Rol-Man in direct proportion to the intensity of these forces. The greater the forces, the greater the resistance developed by Rol-Man. Underneath its surface armor, Rol-Man retains its original tough-hardness and ductility to resist breakage. But as the armor slowly wears, the forces that caused the wear renew this armor to resist further wear. That's why Rol-Man High (11% to 14%) Manganese Steel lasts so many times longer than case-hardened carbon steel.

Use Rol-Man for Spring Rigging Connections, Bolster and Transom Wear Plates and all other parts that demand the utmost in abrasion resistance and strength on Passenger Cars and Locomotives.

Manganese Steel Forge Co., 2813 Castor Avenue, Philadelphia 34, Penna.

**PINS • BUSHINGS • WEAR PLATES**

Rol-Man Pins and Bushings are ground to precision diameters. Wear Plates are fabricated to your specifications, ready for installation.



# Properties of HYCAR

## oil-resistant synthetic rubbers

With broader use now permitted, this table should suggest applications in your business

IT is impossible to tell the whole HYCAR story in one page. However, the table at the right can serve to give you some idea of what properties can be had in Hycar compounds and suggest certain combinations of properties that would answer a specific problem for you.

While Hycar's climb to fame originally developed from its superb oil resistance, its applications have grown vastly due to its many other outstanding properties—abrasion resistance, age resistance, low compression set, wide temperature service range, resilience, and many others. And Hycar can be blended with vinyl resins to produce compounds with additional favorable characteristics.

Hycar is now available both for experiment and for production of any essential product. Our Technical Service Staff will be glad to help you with your individual problems. *Hycar Chemical Company, Akron 8, Ohio.*

PROPERTIES OF TYPICAL HYCAR COMPOUNDS	OR-15	OR-25
Specific Gravity.....	1.15 to 1.35	1.15 to 1.35
Tensile Strength (Maximum) p.s.i.....	4500	3500
Tensile Strength (Average) p.s.i.....	1500 to 3000	1000 to 2500
Elongation at Break—%.....	100 to 800	100 to 700
Hardness, Shore Durometer, Type A.....	10 to 100	10 to 100
Oil and Solvent Resistance..... Percent		
Volume Change after Immersion:		
Kerosene—48 hours at room temperature.....	—3 to +4	+1 to +12
Gasoline—48 hours at room temperature.....	—3 to +2	—4 to +10
Aromatic Fuel—168 hours at room temperature.....	+10 to +20	+15 to +30
Ethyl Alcohol—48 hours at room temperature ..	+3 to +10	+3 to +10
Ethylene Glycol—70 hours at 212° F.....	—5 to +10	—4 to +15
SAE 20 Lub. Oil—168 hours at 212° F.....	—10 to +2	—10 to +4
Hydraulic Oil—168 hours at 212° F.....	—10 to +5	—5 to +10
Carbon Tetrachloride—48 hours at room temperature.....	+25 to +40	+35 to +50
Benzene—48 hours at room temperature.....	+75 to +125	+100 to +150
Acetone—48 hours at room temperature.....	+100 to +200	+150 to +250
Distilled Water—70 hours at 212° F.....	0 to +10	+8 to +18
Abrasion Resistance.....	Excellent	Excellent
Maximum Service Temperature, degrees F.....	250° to 300°	250° to 300°
Minimum Flexibility Temperature, degrees F.....	—30° to —50°	—50° to —70°
Compression Set—ASTM Method B—Percent.....	8 to 22	5 to 20
Age Resistance.....	Excellent	Excellent
Sunlight Resistance.....	Fair	Fair
Resilience—Lupke Rebound, percent energy recovered.....	20 to 50	30 to 60
Coefficient of Expansion, inches per inch per deg. F.	0.00043 to 0.00095	

# Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

## Synthetic Rubbers

Free—write for your copy of the new pocket-size Hycar Glossary of commonly used synthetic rubber terminology.



### EASY ON MEN!

Hand driving screws into garnish molding is slow, hard work. But as long as he used slotted screws, this world-famous manufacturer of automobile bodies didn't dare risk power driving. Driver skids came too high – and too often!



### EASY ON THE POCKETBOOK!

A change to Phillips Recessed Head Screws ruled out driver skids . . . permitted use of power methods. Also eliminated one operation involving countersunk washers. All of which added up to substantial cost-savings!



### EASY ON ENGINEERING!

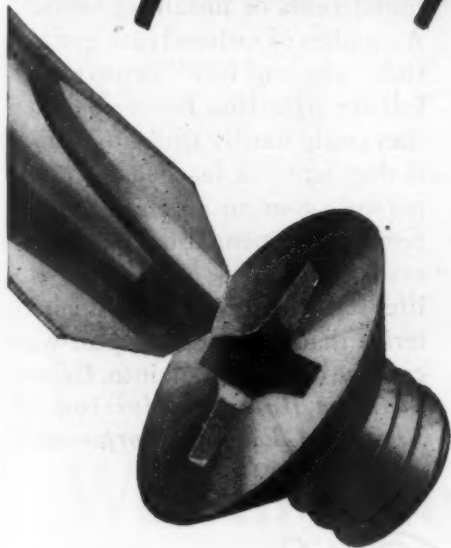
Easy on assemblymen . . . easy on the pocketbook . . . Phillips Screws are kind to design staffs, too. With Phillips, engineers can build product strength and rigidity up to specifications slotted screws just can't approach!



### EASY ON THE EYES!

Besides being strength-builders, Phillips Screws are also great little sales-builders. They help dress up any product . . . do away with unsightly burrs that snag clothing and make an otherwise sweet piece of merchandise look sour!

## It's Phillips the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

... It's the exact pitch of the angles that eliminates driver skids.

... It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

... It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

## PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

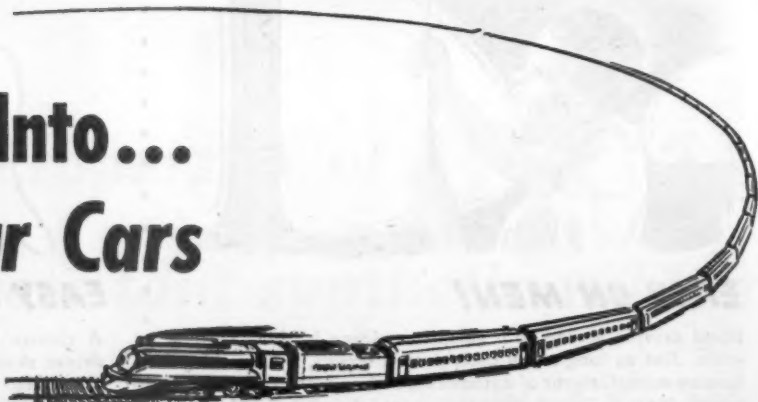
25  
SOURCES

American Screw Co., Providence, R. I.  
Atlantic Screw Works, Hartford, Conn.  
The Bristol Co., Waterbury, Conn.  
Central Screw Co., Chicago, Ill.  
Chandler Products Corp., Cleveland, Ohio  
Continental Screw Co., New Bedford, Mass.  
The Corbin Screw Corp., New Britain, Conn.  
General Screw Mfg. Co., Chicago, Ill.

The H. M. Harper Co., Chicago, Ill.  
International Screw Co., Detroit, Mich.  
The Lamson & Sessions Co., Cleveland, Ohio  
Manufacturers Screw Products, Chicago, Ill.  
Milford Rivet and Machine Co., Milford, Conn.  
The National Screw & Mfg. Co., Cleveland, Ohio  
New England Screw Co., Keene, N. H.  
Parker-Kalon Corp., New York, N. Y.  
Pawtucket Screw Co., Pawtucket, R. I.

Pheol Manufacturing Co., Chicago, Ill.  
Reading Screw Co., Norristown, Pa.  
Russell Burdall & Ward Bolt & Nut Co., Port Chester, N. Y.  
Sevill Manufacturing Co., Waterville, Conn.  
Shakproof Inc., Chicago, Ill.  
The Southington Hardware Mfg. Co., Southington, Conn.  
The Steel Company of Canada Ltd., Hamilton, Canada  
Wolverine Bolt Co., Detroit, Mich.

# Worth Looking Into... for Post-War Cars



Alkaline Batteries are equally suitable for use in 32-volt, 64-volt and 110-volt systems. They have been giving dependable service for many years in all three.

In electrical systems on post-war cars, power demands for air-conditioning, ample lighting, and other passenger conveniences and luxuries will put a high premium on the dependability of the power supply including the storage batteries. On tomorrow's new cars Edison Alkaline Batteries not only can help reduce weight but can also provide unequaled dependability.

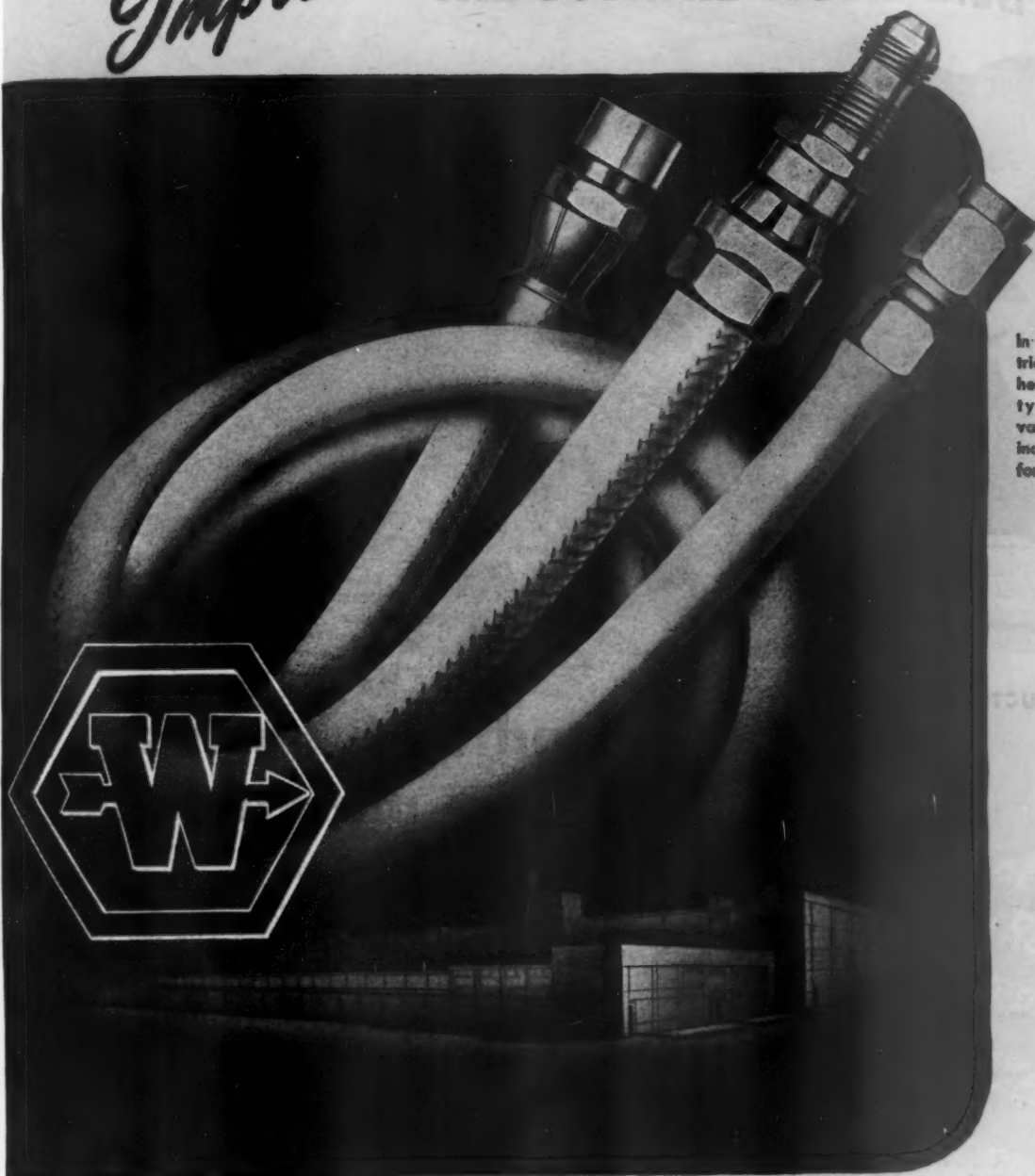
In fact, after delivering normal service life on passenger cars, they are often regrouped and re-applied to baggage, express or other cars having smaller load demands. There they give additional years of unfailing service. A number of railroads are getting this "second life" from their Edison Alkaline Batteries. Yet they could hardly afford to do this if they had not learned from experience that an alkaline battery remains a dependable power unit even beyond its normal service life. It's a feature of alkaline batteries that designers of post-war cars are urged to look into. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J.*

## Edison

**THE LIGHTWEIGHT BATTERY  
FOR LIGHTWEIGHT CARS**



# Improved INDUSTRIAL HOSE LINES



In addition to industrial hose, Weatherhead plants make all types of fittings, valves, hydraulic cylinders and other parts for these industries:

## AUTOMOTIVE

★

## REFRIGERATION

★

## RAILROAD

★

## MARINE

★

## FARM EQUIPMENT

★

## ROAD MACHINERY

★

## DIESEL

★

## L. P. GAS

★

## APPLIANCE MANUFACTURERS



Look Ahead with



# Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO  
Plants: Cleveland, Columbia City, Ind., Los Angeles  
Canada - St. Thomas, Ontario

New uses are being found daily for the application of our improved industrial hose lines on machinery of all kinds. We manufacture hose assemblies of all types to withstand pressures up to 10,000 P.S.I. They can be equipped with either permanent crimped ends or with re-usable, quick-attachable hose ends. For information or literature write or phone any Weatherhead branch office.

BRANCH OFFICES: NEW YORK • PHILADELPHIA • DETROIT • CHICAGO • ST. LOUIS • LOS ANGELES

See the  
BEAUTY

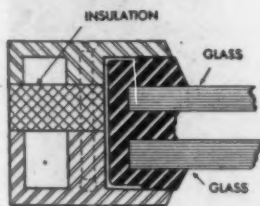
of Having ADLAKE WINDOWS



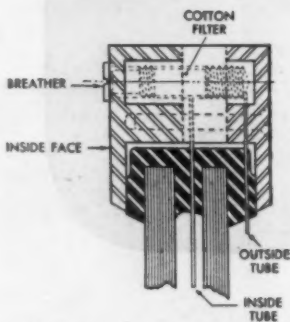
There is no dehydrating compound to become saturated . . . thus none to replace. Adlake Windows eliminate all maintenance except routine washing or replacement of broken glass.

#### CONSTRUCTION DETAILS

Both frames of Adlake Sash are insulated from each other. This prevents cold from traveling to inside of unit—prevents frosting.



Note inside and outside "breather" tubes. These permit air between panes to adjust to changes in temperature and altitude—prevent clouding without use of a dehydrant.



Adlake CURTAINS . . . should be included. They never shake, rattle or jangle. Swivel tips prevent change in length; rubber shoes stop noise and creeping. Ask for details about Adlake Curtains . . . Curtain Fixtures . . . Sectional Diaphragms . . . Vestibule Curtains.

...and with no fuss,  
no maintenance!

A beautiful girl . . . a beautiful scene . . . and beautiful, clear, unclouded windows. That's the beauty of having Adlake Double-Glazed Sash Units. You can easily SEE their advantages . . . so can your passengers.

Adlake Windows assure visibility at all times unaffected by fog or frost. An exclusive principle—the Adlake Breather—permits the air between the two panes to adjust quickly to temperature and altitude changes.

Adlake Double-Glazed Windows are again furnished in aluminum and can be aluminized if desired. They are designed and produced for new cars or reconditioning present equipment, and to standards that have won their reputation for superiority throughout years of service.

Write for prices and details . . . and specify Adlake.



# THE ADAMS & WESTLAKE COMPANY

ESTABLISHED IN 1857

ELKHART, INDIANA

NEW YORK • CHICAGO

ADLAKE RAILWAY CAR EQUIPMENT, FITTINGS and SPECIALTIES • DOUBLE-GLAZED ALUMINUM WINDOWS • WINDOW CURTAINS • VESTIBULE CURTAINS • SECTIONAL DIAPHRAGMS • LUGGAGE RACKS • ASH RECEPTACLES • HARDWARE

*G-E lamps can help provide plenty of "seeing" light and create cheerful atmosphere in postwar lounge cars. Passengers will enjoy traveling like this! "The Mercury," New York Central System.*



**Good lamps are the heart of good lighting**

The aim of  
General Electric Lamp Research  
is to make G-E Lamps  
*Stay Brighter Longer*

Lamps marked G-E bring you the benefits of over  
50 years of General Electric Lamp Research . . .  
more and more light at less and less cost.

**G-E MAZDA LAMPS**

**GENERAL  ELECTRIC**

BUY WAR  
BONDS AND  
HOLD THEM





Southern Pacific Bar-Lounge Car with "Safety 68" Fluorescent Lighting.

# MUTUAL PROTECTION

Each component part of *car lighting equipment* should regulate and protect the functions of every other part of the equipment.

A knowledge of the inherent operating characteristics of each part of an equipment is essential when engineering its design and operation.

As manufacturers of all parts of complete

car lighting equipment we have an intimate knowledge of each and see that all parts function for mutual protection of each and for joint efficiency of all.

From generator, through regulators and motor alternators to and including the lighting fixtures and lighting troughs there are Safety Company complete equipments for lighting any type of passenger car.



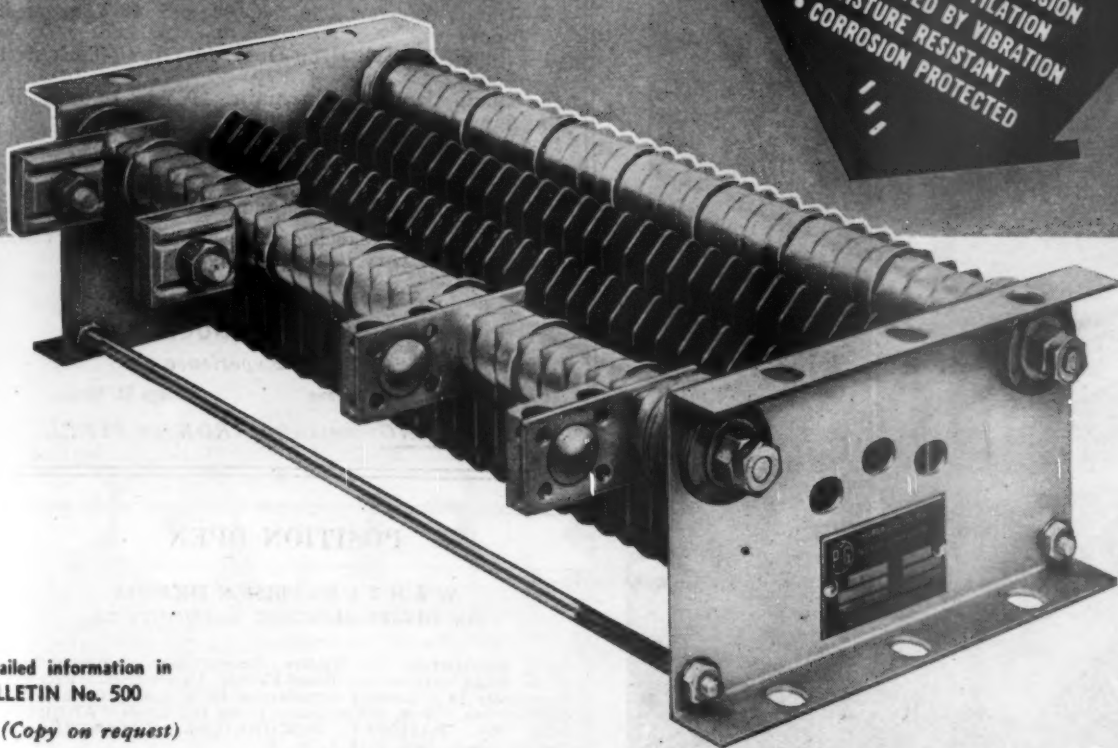
THE SAFETY CAR HEATING and LIGHTING COMPANY, INC.  
NEW YORK - CHICAGO - SAN FRANCISCO - PHILADELPHIA - BOSTON - ST. LOUIS - MONTREAL



WHERE THE GOING IS TOUGHEST

use **P-G** *Nonbreakable*  
*Steel Grid Resistors*

- ALL STEEL CONSTRUCTION
- MICA INSULATION
- RUGGED TERMINALS
- PROVISION FOR EXPANSION
- ADEQUATE VENTILATION
- UNAFFECTED BY VIBRATION
- MOISTURE RESISTANT
- CORROSION PROTECTED



Detailed information in  
BULLETIN No. 500

(Copy on request)

POST-GLOVER Steel Grid Resistors use steel and mica as basic materials to create continuous trouble-free resistor service. These materials and the unique P-G features of design provide a resistor capable of meeting the toughest of operating conditions. Neither vibration, moisture nor corrosive atmospheres have material effect on quality of service. Always specify P-G.



*The Nonbreakable Steel Grid Resistor*

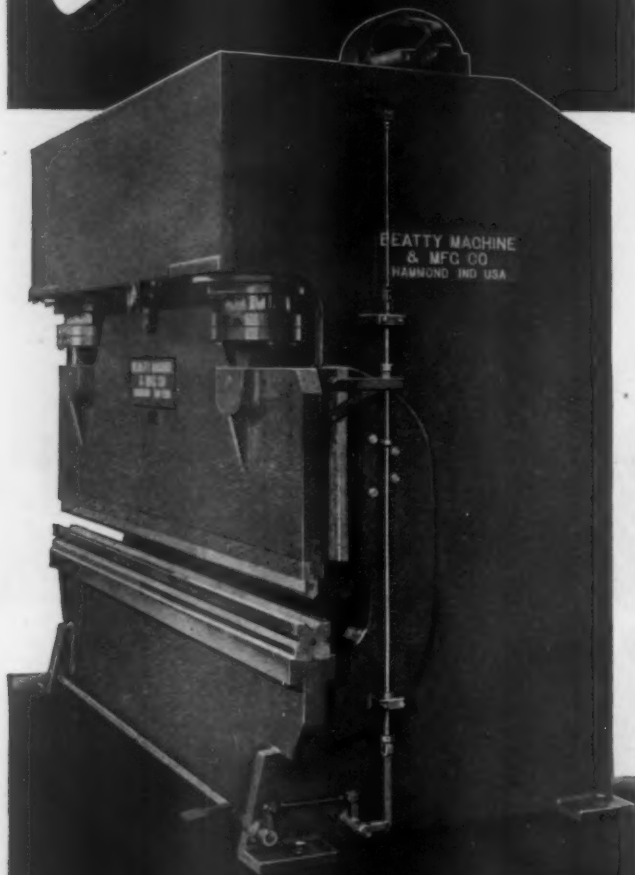
**THE POST-GLOVER ELECTRIC COMPANY**

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

# Beatty

MODERN DESIGN



• The modern contour of this new BEATTY Heavy Metal Working Press reflects its equally advanced engineering. The finer performance of BEATTY equipment is proof that two heads are better than one, for every BEATTY machine combines the thoughts of a BEATTY engineer and a fabricator with a problem. Each machine is custom-built for the job to be done. And here's an invitation: Bring your next heavy metal working problem to us; perhaps we have solved many similar problems.



**BEATTY** MACHINE & MFG. COMPANY  
HAMMOND INDIANA

## GET TOGETHER DEPARTMENT

### FOR SALE

#### FREIGHT CAR PRICES REDUCED!

Now only half of recent peak prices!  
\$500.00 to \$4250.00 each!

Which of these cars could you use?

- 8—Hopper, Twin 50-Ton
- 40—Hopper, Triple, 50-Ton
- 50—Hopper, Side-Discharge, 50-Ton
- 80—Refrigerator, 40-Ft., 40-Ton
- 16—Refrigerator, 36-Ft., 30-Ton
- 50—Box, 40-Ft., 40-Ton
- 10—Dump, Magor, Automatic, 30-Yd., 50-Ton; lift doors
- 9—Dump, Western, Automatic, 30-Yd., 50-Ton; lift doors
- 4—Dump, Western, 30-Yd., 40 and 50-Ton; steel floors
- 1—Dump, Koppel, Drop-Door, 20-Yd., 40-Ton; steel floors
- 25—Dump, Koppel, Automatic, 20-Yd., 40-Ton, lift doors
- 20—Flat, 40-Ft., 40 and 50-Ton
- 70—Gondola, All Steel, 40-Ft., 16 drop doors
- 6—Gondola, 50-Ton, High-Side, Steel
- 10—Tank, 8000-Gallon, 40 and 50-Ton

Perhaps this list also has some other cars you could use to very beneficial advantage now!

All cars are priced to sell!

**IRON & STEEL PRODUCTS, INC.**

40 Years' Experience

13470 S. Brainerd Avenue

Chicago 33, Illinois

**"ANYTHING" containing IRON or STEEL"**

### POSITION OPEN

**WANTED — DESIGN ENGINEER**  
ON DIESEL-ELECTRIC LOCOMOTIVES

Large manufacturer in Western Pennsylvania requires a high grade design engineer on Diesel-Electric Locomotives. Excellent opportunity in a growing organization for a man with the right qualifications. Write in confidence, giving full details. ADDRESS BOX 524, RAILWAY MECHANICAL ENGINEER, 30 Church Street, New York 7, N. Y.

## SAVE PAPER



**BUY WAR  
BONDS**







**EXIDE POWER**  
Picks them up and packs them away  
as easily as you can lift a finger

**POWER**



**Exide**  
BATTERIES

**I**N mills, factories and warehouses, unnumbered electric industrial trucks—powered by Exides—are lifting, hauling and stacking unit loads—helping to speed up production, to cut materials handling costs, to conserve vital manpower.

That so many Exide Batteries are employed in this important service, is due to three factors: Exides have the extra power needed to stand the heavy strain; their rugged construction keeps them on the job with minimum attention; and their ample reserves assure sustained speeds throughout each shift. You can always count on Exides for dependability, long-life and ease of maintenance.

Write us for a FREE copy of the bulletin "Unit Loads," prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50%... covers latest developments in materials handling... and includes actual case histories.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

# HAIRINSUL IS PERMANENT INSULATION

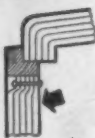


**ALWAYS  
STAYS  
IN  
PLACE!**

With HAIRINSUL lining your refrigerator cars, you'll never have to worry about damage to lading or waste of ice due to gaps in the insulation. HAIRINSUL never settles, never packs down . . . it's all hair in reinforced

blanket form, stays securely in place as long as the car is in use, then it can be re-used in newer cars. Even if

HAIRINSUL is all-hair in reinforced blanket form . . . never packs down, always stays put . . . maintains high refrigerating efficiency in all parts of refrigerator cars.



Some insulating materials may pulverize under vibration, settle and form ice-wasting spaces in wall or roofs. This can't happen in your refrigerator cars if they are lined with HAIRINSUL.



**Hair is Nature's Own Insulation**  
It's nature's protective covering for animal life . . . it's a barrier against extreme outside temperature changes. HAIRINSUL is made of animal hair . . . one of the best reasons why HAIRINSUL is accepted as the finest of insulating materials for refrigerator cars.

it is thoroughly soaked with water, HAIRINSUL dries out good-as-new, retaining its original ice-saving efficiency. When you build new cars, or rebuild old ones, insist on HAIRINSUL insulation for greater efficiency and long-range economy. Write today for samples and engineering data.

AMERICAN HAIR & FELT COMPANY  
Dept. D-4, Merchandise Mart, Chicago 54

## *Hairinsul*

ALL HAIR INSULATION FOR REFRIGERATOR CARS



the SECOND U. S.-made "Megger" Instrument  
... THE MIDGET "MEGGER"\* INSULATION TESTER

Following the production, in June 1943, of the first U. S. -made "Megger" testers, we now announce a second "Megger" instrument being built in our Philadelphia factory—the Midget "Megger" Insulation Tester.

This new U. S. model is identical in design and similar in every way to the Midget "Megger" Insulation Testers we have been supplying for the past ten years, except that the molded plastic housing is mottled brown instead of red.

The Midget "Megger" Tester has achieved wide popularity because of its size and low cost. Weighing but 3 pounds, it is always ready to use for testing insulation resistance of a wide variety of electrical equipment. It is indispensable for maintenance and trouble shooting, even where higher range "Megger" testers can be used . . . reads up to 50 megohms and delivers 500 volts d-c from a hand-cranked generator, making it independent of batteries or external power supply. Lower ratings are also available.

Manufacturing facilities are complete and our expanding production makes availability of these new instruments far better than we have previously been able to offer. We invite your orders for them.

**JAMES G. BIDDLE CO.** 1211-13 ARCH STREET  
PHILADELPHIA 7, PA.



For complete description of the new U.S.-made Midget "Megger" Tester, see Bulletin 1785-X.

\*By special arrangement with the original makers of the "Megger" Testing Set, our new instrument carries the U. S. Registered Trade Mark "MEGGER".

# Here's why AIRETOOL TUBE CLEANERS & EXPANDERS

SAVES



TIME

SAVES



TUBES

SAVES



MONEY

## NEW FORM CUTTERS

Made of special heat treated alloy steel for longer life. Cutters will not track or damage tubes when properly used. Removes scale and other de-

posits quickly, efficiently and thoroughly. Made in styles to clean Arch Tubes, Branch Lines, Circulating Tubes, Automatic Blow Down Pipes, Nicholson Syphons, etc.



ARCH  
TUBE  
CLEANER

## POWERFUL MOTOR

Airetools unique power seal motor develops up to 28% greater power and, yet, can be loaded down to 50 rpm without stalling. Constant torque at low speeds. Picks up immediately when load is released. Slip fit construction for easy maintenance.



## TUBE EXPANDERS →

The unusual construction and the use of special heat treated alloy steels in manufacturing Airetool Tube Expanders assures longer life. Made in a wide variety of sizes and designs to meet every tube expansion need.

NICHOLSON  
SYPHON  
CLEANER

## HELPFUL BULLETINS

are available which explain Airetool products, their use and selection. Write for your copies.

510 Airetool & Yost Superior  
Factory Bldgs.  
Springfield, Ohio

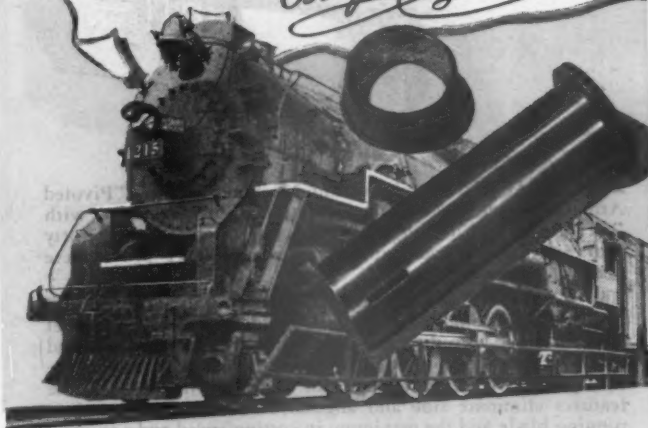


**AIRETOOL** MANUFACTURING  
COMPANY



For want of a nail, the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost, being overtaken and slain by the enemy; all for want of a little care about a horseshoe nail.

*Benjamin Franklin*



## A LITTLE THING but...

Railroad pins and bushings are little things in size. Yet they are tremendously important to efficient operation of locomotives and rolling stock. That is why more than 125 American railroads now standardize on hardened and ground Ex-Cell-O pins and bushings. Their experience proves that Ex-Cell-O pins and bushings last longer, and often give service without appreciable wear for hundreds of thousands of miles. Write now for Ex-Cell-O Bulletin 32301.

**XLO**

EX-CELL-O for PRECISION

45-37

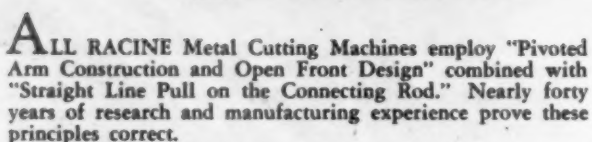
Railroad Division

**EX-CELL-O CORPORATION**

Detroit 6, Michigan



**FOR MAXIMUM  
CUTTING EFFICIENCY**



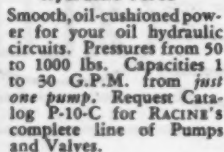
The following are added **RACINE** advantages — Progressive Feed throughout the cutting stroke. The open front facilitates loading. Removable front vise jaws. Replaceable table plates and wear plates on vise jaws. Tee slots in table plates to permit clamping of odd shaped work. Single lever hydraulic operation and control. All these contribute to the work capacity of this equipment.



**RACINE Pivot Arm Construction**

**Horizontal Cutting Construction**

## A Modern Source of Hydraulic Force



- ★ RACINE'S Modern Design, with simple, single lever control, insures easy handling, lower cost per cut.
- ★ RACINE'S line is complete. Capacities 6"x6" to 20"x20". General purpose and high production type machines.

# GET THIS R FOR AILING MOTORS



**SPEER can help you speed your trouble shooting on ailing motors by the use of its Brush Data Forms . . . can prescribe the brush grade best suited for their operating characteristics and service conditions. Why not let SPEER apply its 45 years experience in brush making and application in finding the right cure for excessive brush wear, chattering, burning, sparking, overheating and other commutation ailments.**

Chances are SPEER can improve the performance of motors, generators and converters for you as it has for many others. There's no charge or obligation. Here's all you need do to take advantage of this service: Send for SPEER Brush Data Forms for all machines whose performance you wish to improve. Fill in and return the forms to us: —back to you will come SPEER'S recommendations. Write today for your Brush Data Forms.



CHICAGO • CLEVELAND • DETROIT  
MILWAUKEE • NEW YORK • PITTSBURGH



*The long and short of*

## TUBE CLEANERS FOR CURVED TUBES



The short, small diameter motors necessary for passage through short radius bends impose harsh restrictions on the power such motors will develop. This lack of power often slows up tube cleaning. It may even cause serious time charges through excessive down-time of equipment cleaned.

Wilson cleaners for curved tubes will help you overcome these and other troubles. There is a Wilson Tube Cleaner for every curved tube from 1" O.D. up and for almost every radius. Let a Wilson Tube Cleaner cut your down-time and solve your curved tube cleaning problems.

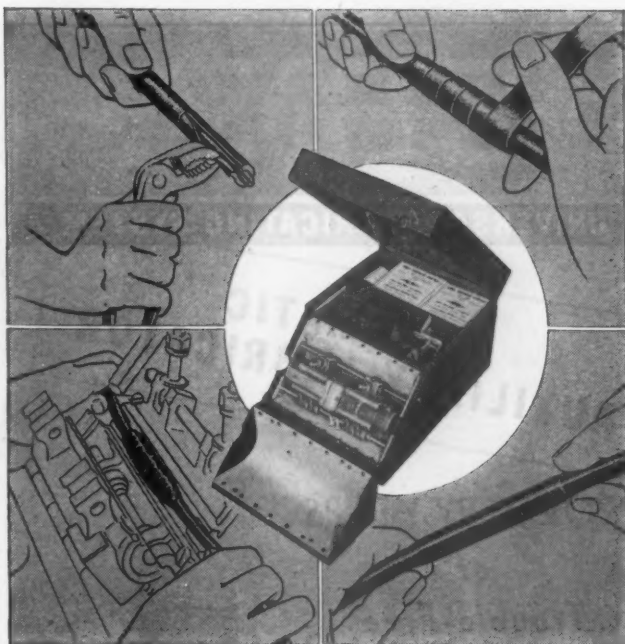
Thomas C. Wilson, Inc. maintains a large engineering staff for consultation on difficult or unusual tube cleaning problems. Write today for a copy of the new Wilson Tube Cleaner Check List and a 40-page bulletin describing the complete line of Wilson Tube Cleaners. No obligation.

Modern tube-cleaners for the problems of today.



**THOMAS C. WILSON Inc.**

21-11 44th AVENUE, LONG ISLAND CITY 1, NEW YORK



## MINES KIT BOX

### VULCANIZER ASSEMBLIES

*Provide Cable Safety—*

*Reduce Operating Costs*

Cable repairs, so important in electric cable maintenance, can be made quickly with a MINES Kit Box Vulcanizer Assembly. Make-shift, temporary repairs to cables, often dangerous to life and property, are a thing of the past with a Mines Kit on the job.

The Kit Box Assembly VDIR 213, shown above, will handle cables up to 1 3/8" in diameter and will accommodate a mold up to 13" in length. Comes packed in a sturdy, light steel carrying case, 23" x 15 3/4" x 13", and weighs about 120 pounds. Easy to move to cable trouble. Total heating capacity 1200 volts, operates on 115 volts AC.

This portable Kit Box contains all necessary supplies and tools. The Vulcanizer itself is mounted right into the Kit Box. Each unit is complete with heating elements, thermostatic controls, cable holding clamps, power input cord, wrenches, and an operating instruction manual.

Also available in smaller size and Bench type. We also make Vulcanizers for all size cable and electrical conditions. Write for Bulletin RV-104K.

**MINES EQUIPMENT COMPANY**

4280 CLAYTON AVE.

ST. LOUIS 10, MISSOURI

*Makers of the Connector with the Water-Seal*



**AUTOMATIC  
AUXILIARY LUBRICATOR**

**PROVED BY YEARS  
of  
Trouble-Free  
Service**

**.. ON AIR PUMPS  
.. STOKER ENGINES  
.. FEED WATER  
PUMPS**



The Edna Automatic Auxiliary Lubricator provides positive lubrication for a locomotive whether running or standing. Extremely simple in construction, the Edna Lubricator has only two wearing parts — proved by years of service to be trouble-free. Extremely low in initial cost, this device requires minimum attention and maintenance, consumes oil without waste. Used by leading railroads. Write for Bulletin A-100B giving complete details.

FORCE FEED LUBRICATORS  
"POSITIVE" OIL FEED DIVIDERS  
AUTOMATIC AUXILIARY LUBRICATORS  
HYDROSTATIC LUBRICATORS • OIL CUPS  
LIFTING and NON-LIFTING INJECTORS • BOILER CHECKS  
VALVES • COCKS: CYLINDER — GAUGE — TANK  
REFLEX WATER GAUGES • WATER COLUMNS  
"EDNALOY" CASTINGS

**THE EDNA BRASS MFG. CO.**

Sales Agent of National Lead Company

525 READING ROAD

CINCINNATI 2, OHIO

**An Efficient  
work-bench**  
*Easily carried to  
your job*



## **RIGID** **Portable Tristand Vise**

● This roomy Tristand folds up snugly, carries easily, sets up solid anywhere you need it. Screw-down feet and ceiling brace if you want them. Lots of space for oil can and dope pot, plenty of slots to hang tools. It has a pipe rest and 3 handy pipe benders — and an efficient vise with LonGrip jaws, easy on polished pipe. Buy it for easier work — at your Supply House.

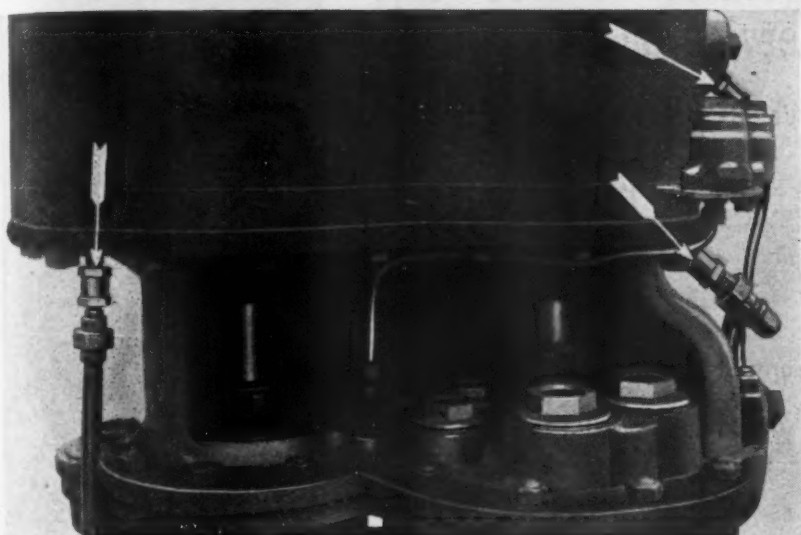


**RIGID**  
**WORK-SAVER PIPE TOOLS**  
THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.



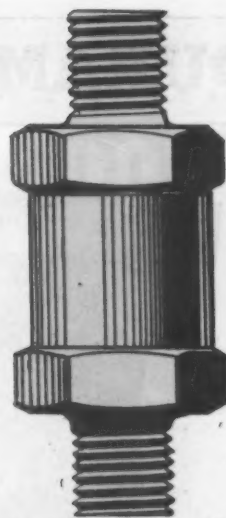
## TOM DRAIN VALVES

Drain  
Condensation *Automatically!*



Tom Drain Valves applied to the locomotive air compressor drain condensation when the compressor is not working. Three brass valves are required for the 8½" CC locomotive air compressor. Style #1 for the HP cylinder and also for the LP cylinder and Style #1-A for Main Steam Inlet.

Valves will not clog — Will not freeze — Need no Extra Attention



In use on railroads for past eight years on:

Locomotive Air Compressors,  
9½", 11", 8½" CC and 10½" CC  
Steam Blower Line  
Between Engine & Tender  
Booster Lines  
Elesco Feedwater Pumps  
Worthington Feedwater Pumps

### JOSEPH SINKLER, INC.

122 S. Michigan Avenue  
CHICAGO 3, ILLINOIS



## GRIND DIESEL VALVE SEATS THE FACTORY WAY



Left: Close-up of  
the patented HALL ECCENTRIC  
or Point Contact Grinding Principle

HALL Service type Diesel Valve Seat Grinders are identical in principle and performance with large HALL Multiple Spindle Seat Grinders as used by leading manufacturers to insure finest precision and finish in their engine production; finer performance longer.

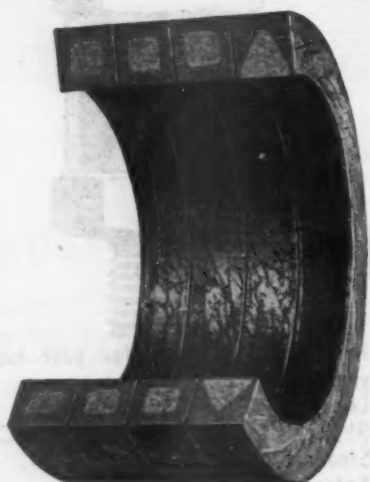
Write for complete details on HALL Diesel Valve Seat Grinders and Wet Type Valve Refacers

THE HALL MANUFACTURING CO., TOLEDO 7, OHIO

# HALL

With the HALL Model EDP Seat Grinder shown above any mechanic can quickly and easily service diesel valve seats to factory standards of precision and finish. HALL ground valve seats assure better performance longer.

# DURAMETALLIC Expansion Joint Packing



CROSS SECTION OF  
DURAMETALLIC STYLE D-114

Shopping to Shopping  
Service on Saturated  
and Superheated Steam

FOR LONG UNINTERRUPTED  
SERVICE on locomotive expansion  
joints — specify Durametallic . . .  
an anti-frictional, flexible metallic  
packing with resilient core that  
insures a free working joint.

WRITE FOR ILLUSTRATED  
BULLETIN AND PRICES



DURAMETALLIC EXPANSION  
JOINT PACKING — STYLE D-110

**DURAMETALLIC**



**CORPORATION**

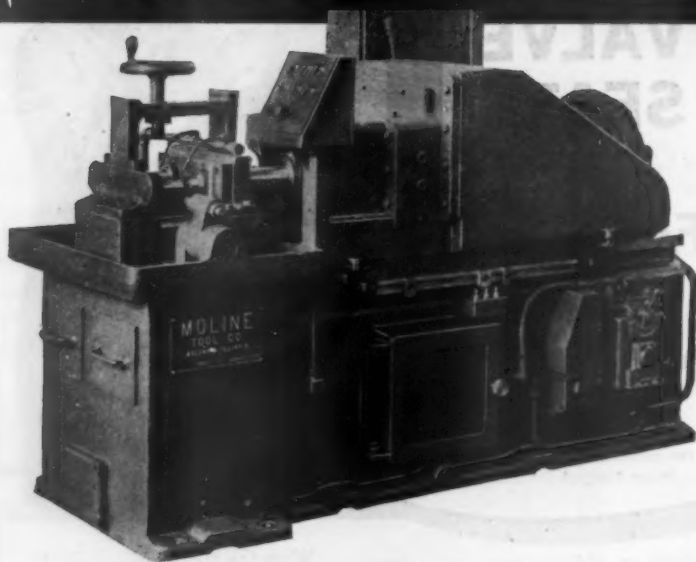
KALAMAZOO

MICHIGAN

Manufacturers of PACKINGS for — AIR PUMPS •  
WATER GAGE GLASS • FEED WATER PUMPS • VALVE STEMS •

STOKERS • EXPANSION JOINTS • CAB COCKS  
REVERSE GEARS AND DURA HOOK PACKING PULLERS

## *This* **HOLE HOG** features Trouble-Free Service

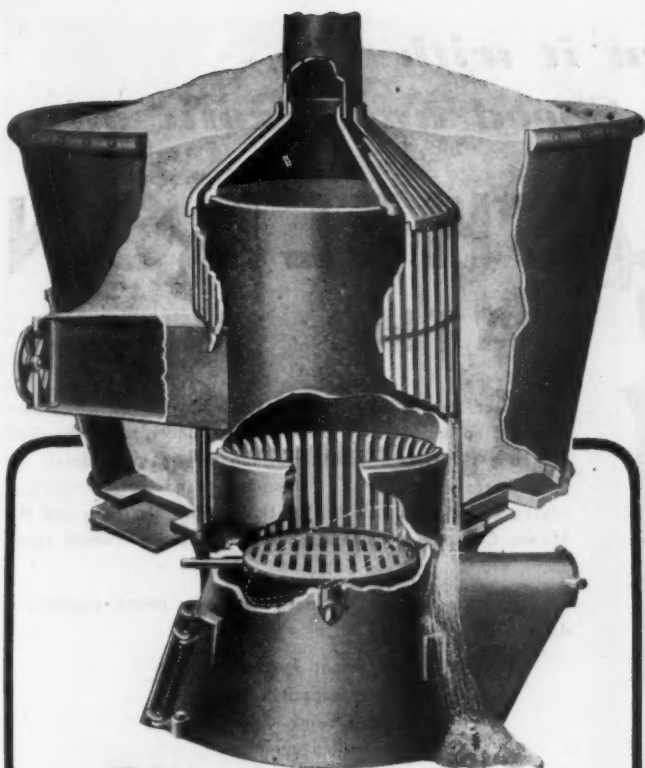


A Moline MR127 Horizontal Hydraulic Feed Machine of the type shown here has been giving trouble-free service since 1937 in a rail yard of one of this country's more progressive transportation systems. Two bolt holes at a time are drilled rapidly in the ends of rail sections while they are held in the fixture which is built to receive rails from either side and to locate them properly. As is the case with all Moline machines, it is designed to be most effective in performing the work for which it is intended and is, therefore, the most efficient machine for that particular job.



**MOLINE TOOL COMPANY**

**MOLINE, ILLINOIS**



# Viloco

## AUTOMATIC SAND DRYER

### Reduces Fuel Costs for Drying Sand

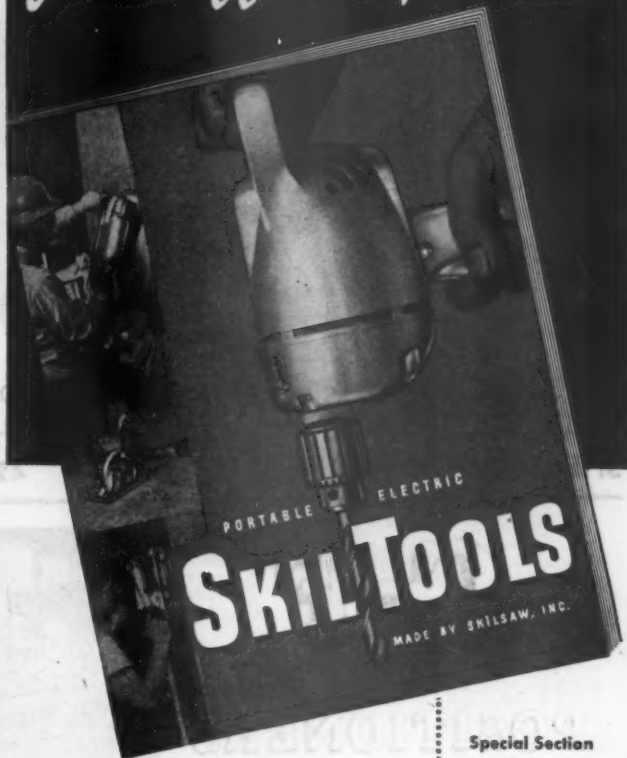
The operation of the Viloco Sand Dryer is automatic—sand flows freely through the grating as it dries. The grating is so constructed that it prevents wet sand coming in contact with the stove. Plenty of cleaning slides are provided around the hopper base for ready removal of any material that cannot pass through the grating. The fire grate can be removed through the ash door. Parts of stove subjected to fire are made of Chrome Nickel Heat Resisting Iron.

The Viloco Sand Dryers are made in two sizes. The hopper capacity of the No. 1 featured above is 3 cubic yards and a smaller size, No. 2, with 1 cubic yard capacity.

The hopper should empty itself about once every two hours under ordinary conditions.

**VILOCO** RAILWAY EQUIPMENT CO.  
332 SOUTH MICHIGAN AVENUE • CHICAGO

Send FOR THIS NEW  
**SKILTOOL CATALOG**  
and MAINTENANCE MANUAL  
*just off the press!*



● Every owner, every operator of portable electric tools needs this manual to help make tools do their job better and last longer. The SKILTOOL Maintenance Manual in the SKILTOOL CATALOG is packed full of useful information on the care and economical use of *all* portable electric tools. Whether you use SKILTOOLS exclusively . . . or whether you also use other makes . . . you'll save money and delay the need for tool repair by reading and heeding the advice in the new SKILTOOL Maintenance Manual and Catalog. It's yours for the asking. Mail the coupon today!

Special Section  
on care and  
operation of  
Electric Tools,  
including:

DO'S AND  
DON'TS that  
help make tools  
last longer

CARE OF  
MOTORS, etc.

How to get the  
most from your  
portable electric  
tools

SKILSAW, INC., 5033-43 Elston Ave., Chicago 30, Illinois  
Please send.....free copies of your new SKILTOOL Catalog  
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Name .....  
Address.....  
City.....State.....



**If it's a small part, turn it with  
Precision, Speed and Profit on a**



Model S-56  
10" Precision  
Lathe

All SHELDON lead screws are cut on the finest Pratt and Whitney "Super-precision" lead screw machine.

**BUILDERS OF GOOD  
LATHES SINCE 1919.**

## **SHELDON LATHE**

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U. S. Army, the Navy and the Marine Corps for mechanized machine shops, instrument repair shops, etc.)

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Bronze or anti-friction bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

**SHELDON MACHINE CO., Inc. • 4216 N. Knox Ave., Chicago 41, U. S. A.**

# **C-F**

## **POSITIONERS**



### **Where a "Quick Change" is Needed**

In production welding, which means working on top, bottom and on all sides of the weldment, a "Quick Change" of position is necessary for greater time saving, greater efficiency, greater safety to men and materials, and with resulting **LOWER COSTS**. A C-F positioner will do all this at the press of a button, without crane help or handling crews—it will rotate a full 360° at variable speeds from 0 R.P.M. up, tilt to 135° beyond horizontal, and permits welding, down-hand, all sides, surfaces and angles in the one set-up with larger rods and fewer passes. All C-F positioners are pedestal mounted for maximum floor and work space—all are adjustable for height.



Write for Bulletin WP-22

**CULLEN-FRIESTEDT CO.**

1324 South Kilbourn Avenue CHICAGO 23, ILL.

# LUFKIN PRECISION TOOLS



Toolmakers turn out better work with better tools. That's why so many prefer Lufkin calipers, radius gages, indicators, and other precision tools. Lufkin tools are best—best for your workmen, best for accurate production in your plant. Specify Lufkin in your tool requisitions. Write for free, complete catalog.



## LUFKIN

SAGINAW, MICHIGAN • NEW YORK CITY  
TAPES • RULES • PRECISION TOOLS

# HEMINGRAY INSULATORS

*Favorably Known Since 1870*



**HEMINGRAY NO. 53 —**  
*A single piece transposition  
insulator which can be used  
on standard pin.*

## LONG LIFE—MOULDED IN!

Hemingray Insulators are designed to withstand every type of weather.

And they're *precision-built—under exacting step-by-step quality production control!*

That's why they are able to defy rain and snow and sleet—to stand faithfully on guard through the hottest days of summer and the coldest nights of winter.

Hemingrays are sold by principal jobbers and are manufactured by Owens-Illinois, Hemingray Division, Muncie, Indiana.

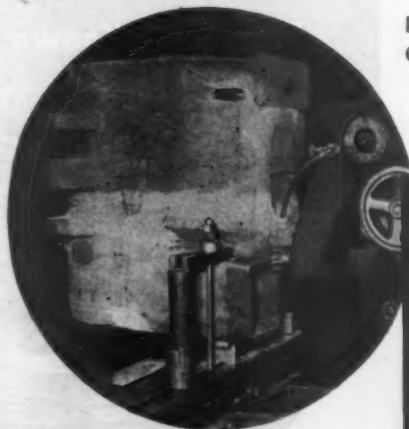
## OWENS-ILLINOIS HEMINGRAY INSULATORS

Telephone - Telegraph

EXPORT AGENTS: INTERNATIONAL STANDARD  
ELECTRIC CORPORATION, NEW YORK CITY

# UNIVERSAL BORING MACHINE FEATURES INSURE PRODUCTIVE CAPACITY AND ACCURACY

- ① Three Bed Ways—span 44 inches.
- ② Table Semi-Box design, heavily ribbed.
- ③ Meter mounted directly on base.
- ④ Saddle lead screw not mounted between guiding ways.
- ⑤ Centralized right hand control.
- ⑥ Heavy duty type—heaviest 4' spindle machine built.
- ⑦ One shot lubrication for head, also for saddle and table assembly.



# UNIVERSAL

BORING MACHINE COMPANY  
HUDSON, MASS., U. S. A.

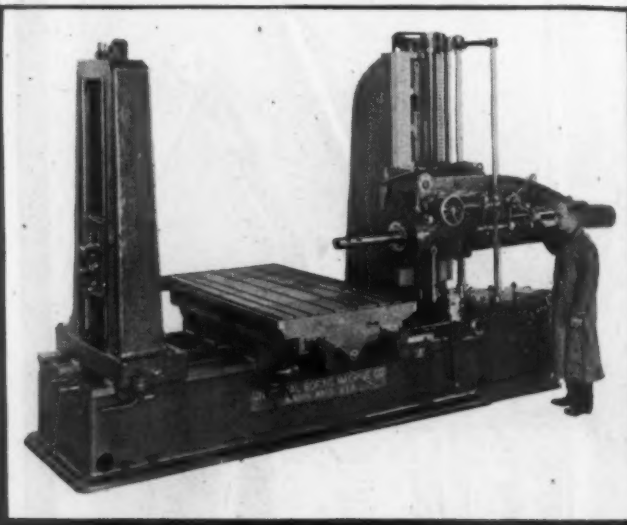
Railway construction and maintenance shops will find the UNIVERSAL BORING MACHINE a welcome addition, because of its versatility in precision machining operations.

This improved UNIVERSAL BORING MACHINE is available in 4" and 5" spindle sizes. Both are readily adaptable to do many boring, milling, turning, facing, recessing, and threading operations.

And UNIVERSAL can also show you how to handle many more precision jobs on a UNIVERSAL HORIZONTAL BORING MACHINE with the Tri-Way bed.

Write today for complete information.

◀ Milling Diesel Engine Frame for Switching Locomotive.



Journal Box Lids



by Motor Wheel

- Pressed steel lid.
- No tools required for application to journal boxes.
- Articulated assembly.
- Completely enclosed coil.
- Complete access to box provided by 115 deg. opening.
- Furnished for 5 x 9, 5½ x 10 and 6 x 11 boxes.

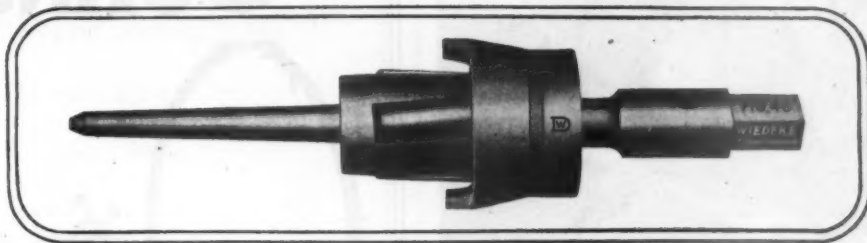
Motor Wheel Lids Meet All A. A. R. Requirements

NATIONAL RAILWAY SALES REPRESENTATIVE

T-Z RAILWAY EQUIPMENT CO., INC., Chicago, Ill.  
MOTOR WHEEL CORPORATION LANSING, MICHIGAN



# IDEAL TUBE EXPANDER



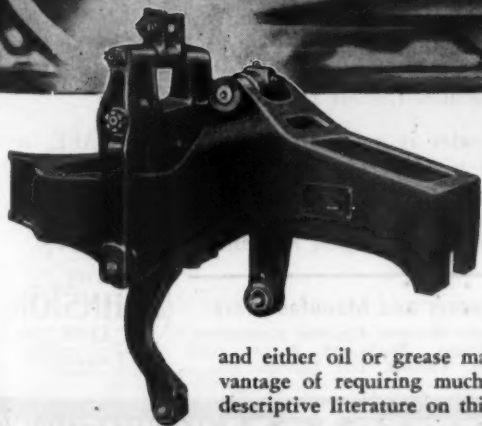
**THE LEADING ROLLER-TUBE EXPANDER  
FOR THE PAST 50 YEARS  
IN AMERICA'S LEADING RAILROAD SHOPS**

Ask for Catalog No. 57R

**THE GUSTAV WIEDEKE COMPANY**

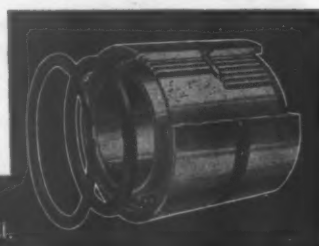
DAYTON ——— OHIO

## MORE POWER WITH LESS FUEL.....



The new improved Baker Long Lap Valve Gear gives great improvement in starting, and makes it possible to maintain higher speeds with less fuel and water. The use of alloy steels has greatly reduced the weight of many parts of this valve gear, and equipped with MCGILL *MULTIROL* Bearings the Baker Valve Gear frequently runs over 500,000 miles without attention.

The MCGILL *MULTIROL* Bearings used in the Baker Valve Gear have great load carrying capacity. They are equipped with thrust washers for taking up lateral wear, and either oil or grease may be used in lubrication. They have the advantage of requiring much less oil than a bronze bushing. Write for descriptive literature on this newly redesigned Baker Valve Gear.

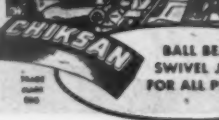
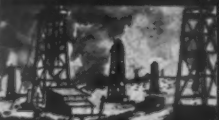
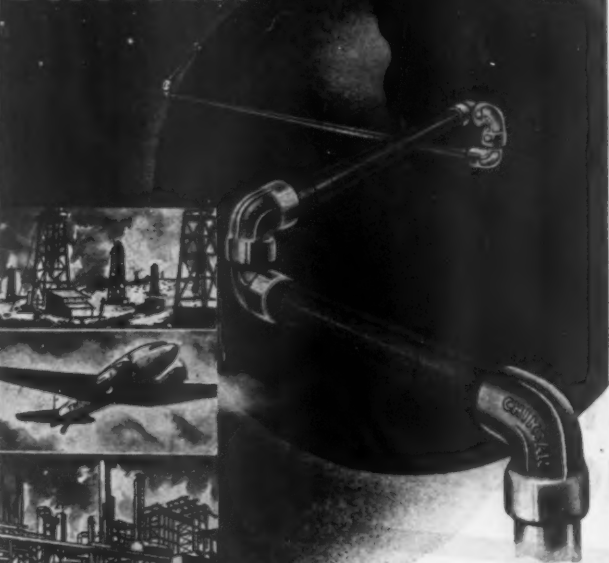


**THE PILLIOD COMPANY**  
Factory—Swanton, Ohio

30 Church St., New York, N.Y.  
310 S. Michigan Ave., Chicago, Ill.

Covering a World of Uses with

# CHIKSAN



On land and sea and in the air  
... wherever liquid, air or vapor  
lines must swing or turn to pro-  
vide for movement of equip-  
ment, vibration or easy handling  
... CHIKSAN Ball-Bearing Swiv-  
els render safe, dependable  
service.

**CHIKSAN FORMULA  
FOR PERFECT FLEXIBILITY**

$$BB_1 + EP = \frac{LT}{P/V}$$

CHIKSAN Ball-Bearing Swivels  
swing or rotate with minimum  
torque because all turning takes  
place on double rows of ball  
bearings. Self-adjusting pack-off  
is equally effective for both pres-  
sure and vacuum. There is noth-  
ing to tighten or adjust.

Over 500 different Types, Styles  
and Sizes assure the correct  
Swivel for every purpose: For  
temperatures to 700° F. in High  
Temperature Joints and for pres-  
sures to 3,000 lbs. in High Pres-  
sure Styles. Sizes range from  
3/8" to 12" ... or larger to order.

Representatives in Principal Cities.  
Distributed Nationally by Crane Co.



BALL BEARING  
SWIVEL JOINTS  
FOR ALL PURPOSES

**CHIKSAN COMPANY**  
BREA, CALIFORNIA

SPECIFY

# JOHNSTON



Valve Body  
with quick  
Detachable  
Union



TOP OF  
RING

BOTTOM  
OF RING

## VACUUM TYPE Locomotive TIRE HEATER

**SAFE VACUUM Principle**—eliminates danger  
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**UNIFORM HEAT**—No hot spots—Fire starts  
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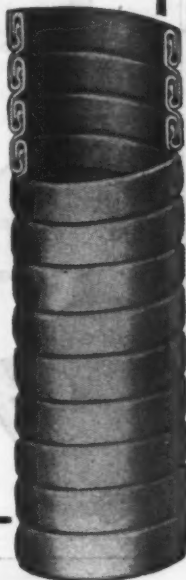
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**T**op choice for tough jobs!

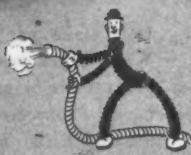
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Flexible Metal Hose for Every Industrial Use



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Plants: Maywood and Elgin, Ill.

PREVENT COSTLY DELAYS AND POSSIBLE DAMAGE TO ENGINES  
WITH AMERICA'S MOST WIDELY USED DIESEL NOZZLE TESTER

## ADECO NOZZLE TESTER

Keeps Diesel Engines  
Running Efficiently



TESTS FUEL INJECTORS  
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At Pressures Up To  
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EQUIPMENT CORP.**

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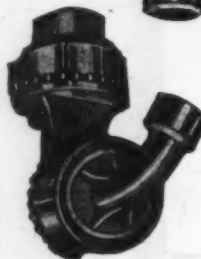
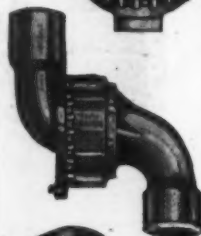
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—are used wherever a flexible or swing pipe joint is required for conveying steam, compressed air, water, oil and other fluids under high or low pressure.



Standard FLEXO JOINTS are made of bronze and designed for working steam pressures up to 250 lbs. and temperatures not exceeding 500° F. For temperatures above 500° F and steam pressures up to 1350 lbs. FLEXO JOINTS are furnished of cast steel. Any desired pipe line flexibility can be obtained by using a combination of the several styles—illustrated at left. They are used in pipe lines that are moved or swung in different directions or on machinery or equipment that must be supplied with any fluid while in motion.



Sizes— $\frac{1}{4}$  inch to 3 inches,  
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Your regular supply house has them or order from

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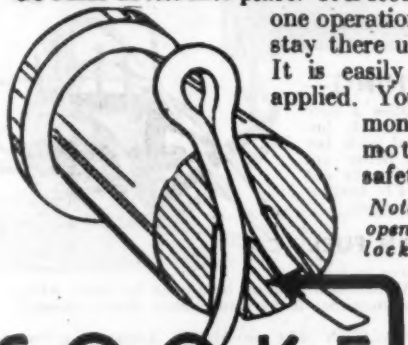
**U. S. Victory Waste Paper Campaign**

## Greater SAFETY For a Lower Cost

**W**HY take chances with ordinary cotters—especially since the speeds of all trains have been increased?

Every application on a car, locomotive or any other moving vehicle can be made in absolute safety with the COOKE Pin and Cotter.

A couple of taps with a hammer drives the COOKE Cotter into place. It is securely locked in one operation—and it will stay there until removed. It is easily and quickly applied. You save time, money and promote maximum safety.



*Note: This wedge opens, spreads and locks the cotter, thereby eliminating vibration and wear.*

**COOKE PIN and COTTER**

"SELF OPENING—SELF LOCKING"

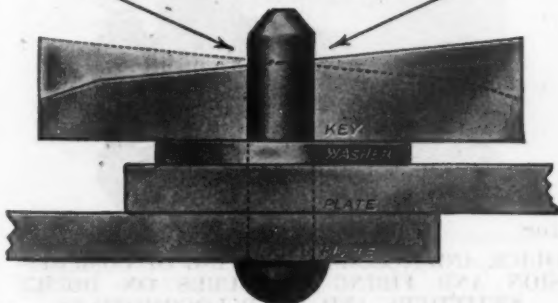
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FOR "FITTING-UP" PURPOSES  
*No Instructions Needed*

DRIVE KEY FROM EITHER SIDE

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— Last Longer —

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**recommend**

**JUSTRITE**

**for**

**Safety**



Model No. 46-S

● The Inspector's Safety Lantern, No. 46-S, shown at left has "kick-out" bulb sockets and "spark-proofed" base that meet the highest safety requirements.

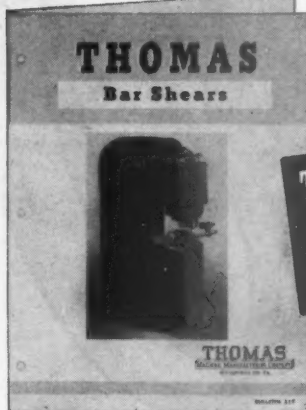
Large fixed handle for carrying over the arm also has two hand grips. The 7-inch reflector fastened around the twin-bulb reflector can be removed and replaced easily. Here is a yard light that's . . . Justrite.

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## NON-CORROSIVE

# Screw Machine Parts

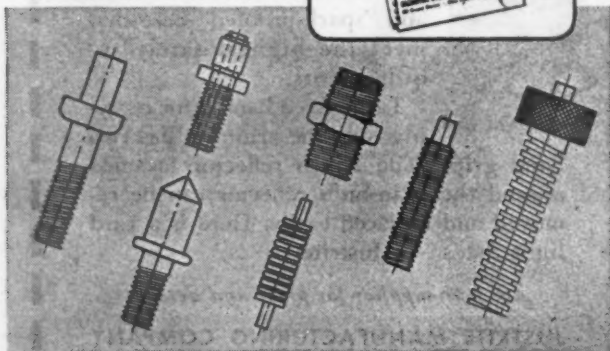
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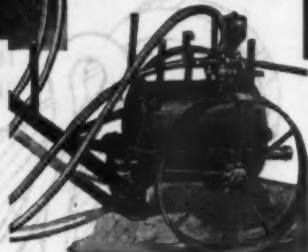


This one-piece, ratchet type Hose Clamp is easily latched by hand, then quickly locked with pliers. Removed by prying locking tongue out of ratchet teeth with screwdriver. It weighs less, has a lower profile, exerts uniform pressure, and may be used over and over again. Approved by Army and Navy Air Forces. Sizes from 1/2" O.D. up. Write for details.

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LOCOMOTIVE  
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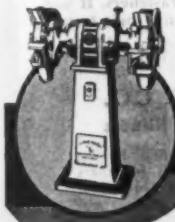


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For Planer, Boring Mill, etc. Without feed, or with horizontal-vertical feeds. 3/4 H.P. to 15 H.P. 3600, 1800, or 1200 R.P.M.

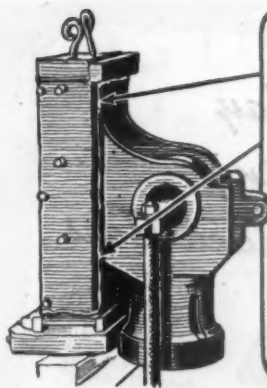


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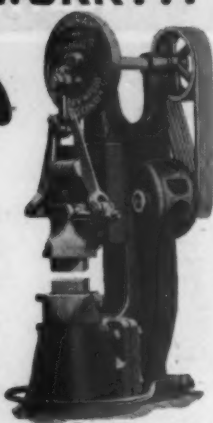
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*Operated either  
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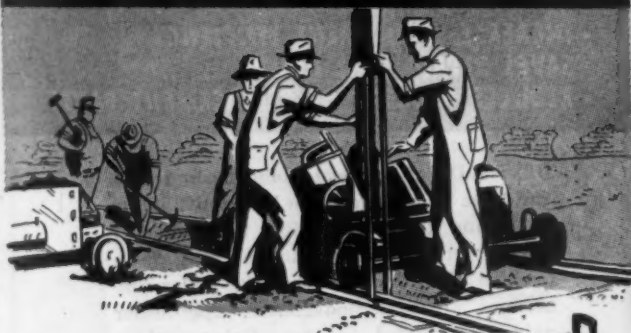
Many roads are now using Alligator V-belt Fasteners. If you are not familiar with this latest development in V-belt fastening you should write for Bulletin V-205.

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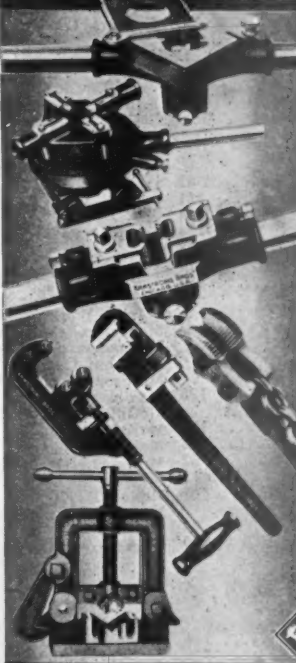
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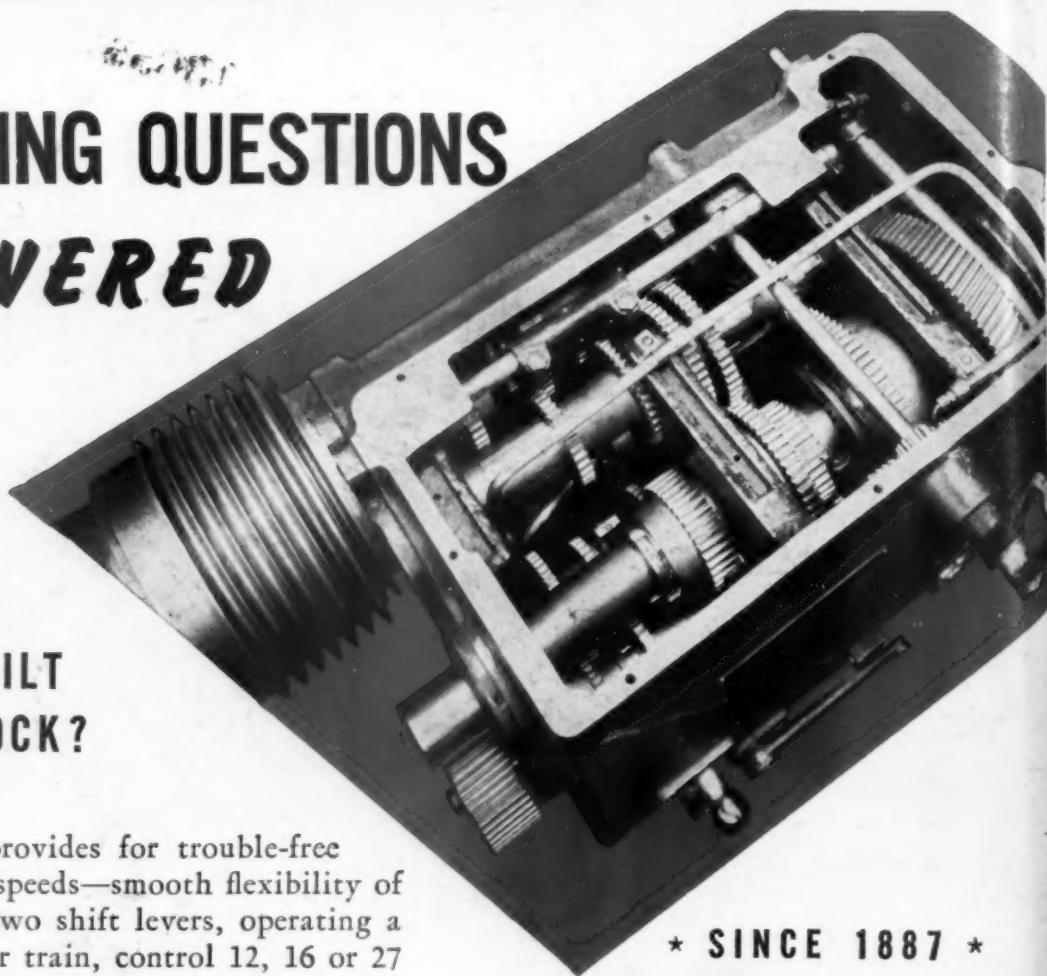
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